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ADST Software Design Document for the BDS-D VIDS-equipped M1

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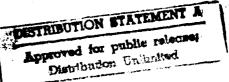
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1. Scope.

1.1. Identification.

This document describes the software design for the Vehicle Integrated Defense System (VIDS) simulation and its inclusion into the existing M1 Tank Simulator software. This software design satisfies requirements contained in the Requirements traceability tables (Section 7).

1.2. System overview.

The VIDS-equipped M1 Tank Simulator exists to support a series of survivability experiments. The nature of the experiments requires that the VIDS simulation be parameter driven. The VIDS parameters not only define available sensors and countermeasures, but also define their respective sensitivities and response times. For the present, eight sensors and nine countermeasures are simulated:

Sensors

- a. Laser Warning Receiver (LWR).
- b. Missile Warning System (MWS).
- c. Future Armored System Radar (FASR).
- d. Seismic Mine Sensor.
- e. Non-Imaging System (NIS).
- f. Tank Radar Warning Receiver (TRWR).
- g. Muzzle Flash Detector (MFD).
- h. Nuclear Chemical Sensor (NCS).

Countermeasures

- a. Multi-Salvo Smoke Grenade Launcher/Rapid Obscuration System (ROS).
- b. Missile Countermeasure Device (MCD).
- c. Combat Protection System (CPS).
- d. Laser Countermeasure Device (LCMD).
- e. Vehicle Magnetic Signature Duplication (VEMASID).
- f. Nuclear Biological Chemical Overpressure (NBCOP).
- g. Advanced Threat Radar Jammer (ATRJ).
- h. Threat Countermeasure System (TCS).
- i. Chaff/Flares.

In general, the VIDS system responds to perceived threats in the following ways:

a. by displaying visual icons on the Commander's Controls Display Panel (CCDP).

- b. by generating alert tones or playing alert messages which can be heard on the tank crew intercom.
- c. by examining user-selected countermeasure activation modes.
- d. by seizing control of the turret.
- e. by activating a selected countermeasure for each perceived threat.

Because VIDS can seize control of the turret, automatic turret rotation for counterfire is supported. Furthermore, VIDS supports automatic turret slewing for visual detection of threats.

1.3. Document overview.

This document identifies and describes new software CSCs and CSUs, as well as changes to and reuse of existing M1 Simulator CSCs and CSUs. Diagrams and narratives are used to explain how the new VIDS simulation executes within the framework of the existing M1 Simulator.

2. Referenced documents.

2.1. Government documents.

SPECIFICATIONS:

1. PM-Survivability: VIDS Armored Vehicle Survivability Equipment (AVSE) BDS-D Functional Specifications, 29 May 1992.

2.2. Non-Government documents.

- Loral: Battlefield Distributed Simulation-Development (BDS-D) Vehicle Integrated Defense System (VIDS) Feasibility Analysis Report, 14 October 1992.
- 2. BBN: The SIMNET Network and Protocols, Report 7627, June 1991.

3. Preliminary design.

3.1. CSCI overview.

The VIDS-equipped M1 Tank Simulator (hereafter referred to as the VIDS-equipped tank) exists as one of many entities participating within a simulated battle. Each entity communicates with other entities by sending and receiving Protocol Data Units (PDUs) on an Ethernet© network. The external interfaces for the VIDS-equipped tank are illustrated in Figure 1.

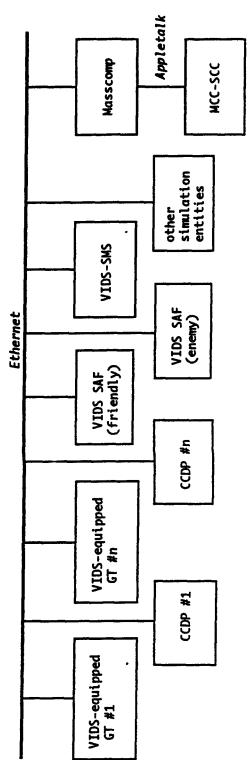


Figure 1. VIDS External Interfaces

Incoming PDUs describe the activity in one or more simulated battlefields. Because the number of incoming PDUs can be quite large, a series of high-level filters are applied to retain only those PDUs which are applicable to a

specific entity. Applicable PDUs are then filtered based upon entity-specific parameters such as exercise number, distance and available sensors. Remaining PDUs are then classified and used to influence either the entity behavior or what the entity can detect.

Outgoing PDUs describe the visual appearance or behavior of the VIDS-equipped tank. Typically, these define the current tank hull position and orientation, the turret orientation, the presence of smoke clouds, chaff/flares or the existence of electro-optical energy. For experimental purposes, a subset of the outgoing PDUs contain instrumentation information which can be used by analysts to better understand VIDS behavior and the use of the soldier-machine interface.

3.1.1. CSCI architecture.

The VIDS capability is partitioned between two host computers. One host is the current M1 tank GT hardware; the other host is a PC with an Elographics touchscreen mounted in front of a 13 inch color video monitor. The software executing on the PC supports the Soldier Machine Interface (SMI), hereafter referred to the as the CCDP. This includes all the VIDS buttons, setup windows and the display windows. The software executing on the GT simulates the behavior of the sensors, countermeasures and threat resolution module (TRM).

The VIDS-PC and VIDS-GT communicate with one another just like other entities participating within a simulated battle exercise. Because there may be multiple VIDS-equipped tanks within the same exercise, the VIDS-PC and VIDS-GT are paired so only appropriate network messages are recognized and processed. In other words, the VIDS-PC knows the unique identifier (VehicleID) of its corresponding VIDS-GT, and the VIDS-GT knows the unique VehicleID of its corresponding VIDS-PC.

3.1.2. System states and modes.

The VIDS-GT CSCI operates in one of six predefined states. These states are:

- a. Startup.
- b. Idle.
- c. Initialize.
- d. Simulate.
- e. Stop.
- f. Exit.

Within the VIDS context, only the Startup, Initialize and Simulate states are significant.

During the Startup State, specific hardware devices are initialized and parameter files are read. It is during this state that the VIDS parameter file (VIDS.D) is read to establish the types and behaviors of available sensors and countermeasures. This file also contains a recommended list of countermeasures for each type of threat.

Once all the tank parameter files have been read, a communication link to the Simulation Network (SIMNET) is established. Having successfully completed these tasks, a transition is made to the Idle State.

During the Idle State, the M1 Tank Simulator waits to receive an activation request from SIMNET. (The activation request is generated by a user of the MCC-SCC console.) When an Activation Request PDU is received, a transition is made to the Initialize State.

During the Initialize State, additional hardware and internal software initialization is performed. For VIDS, sensor detection and identification probability tables are built; and default alert, safety, countermeasure coverage and turret scanning sector settings are sent to the VIDS-PC. Additionally, the list of available countermeasures and the inventories of the expendable countermeasures are sent to the VIDS-PC. Having successfully completed this initialization, a transition is made to the Simulate State.

The Simulate State represents the main processing loop for the VIDS-GT. PDUs sent by the VIDS-PC are read and used to alter the behavior of VIDS. Electro-optical PDUs from other entities are read and used to determine if a threat is present. When a threat is detected, PDUs are sent to the VIDS-PC to provide visual and audible cues. Furthermore, detected threats are prioritized; and countermeasures are selected and activated. The Simulate State continues until:

- a. An impact PDU is received which destroys the tank.
- b. A deactivation PDU is received which forces a transition to the Stop State.
- b. A reconstitute PDU is received which forces a transition to the Idle State.
- c. An exit command is received from the M1 Console keyboard which forces a transition to the Exit State.

During the Stop State, a transition is made to the Idle State, followed by a transition to the Exit State.

For the VIDS-PC, there are only three states: Initialize, Simulate and Shutdown. During the Initialize State, data files are read which define button positions, content and behavior. Furthermore, the VIDS-PC waits to receive the default alert, safety, countermeasure coverage and turret scanning sector

settings from the VIDS-GT. Once these settings have been received, a transition is made to the Simulate State.

As with the VIDS-GT, the Simulate State represents the main processing loop for the user interface. The touchscreen is continually monitored to determine if a button has been depressed or released. Specific button actions may generate brief user alert messages to appear on the display panel. Changed button values or sector coverage widths are sent back to the VIDS-GT to influence the behavior of the sensors and countermeasures. The network buffer is continually polled to determine if PDUs sent by the VIDS-GT require updates to the display or if audible alerts must be activated or terminated.

During the Shutdown State, dynamic memory is released, special interrupt handling is suspended and control is released to the normal operating system.

3.1.3. Memory and processing time allocation.

At the present time, there are no memory budgets more restrictive than those imposed by the respective host computers. However, the VIDS-GT functions which execute during the Simulate State must execute faster than 1/15th of a second. This is due to the fundamental execution cycle on the GT. In fact, the VIDS software execution speed must take only a relatively small percentage (20% or less) of the 66.67 milliseconds since the sum total of all simulated M1 behavior must execute within this time frame.

3.2. CSCI Design Description.

Because the simulated VIDS system is partitioned between two host computers, the description of the VIDS CSC is divided into two parts: the VIDS-GT CSC and the VIDS-PC CSC. Note that the VIDS-PC CSC is also referred to as the Soldier Machine Interface (SMI) and the Commander's Controls Display Panel (CCDP).

3.2.1. VIDS-GT CSC

The VIDS-GT CSC handles the job of simulating the behaviors of available sensors and countermeasures. Parameters sent by the VIDS-PC CSC are used to constrain the behavior of the VIDS-GT CSC. Parameters sent by the VIDS-GT CSC to the VIDS-PC CSC are used to inform the tank commander what is known about any hostile threats. Specific design features include:

a. The VIDS-GT CSC satisfies all requirements presently allocated to the GT. Refer to the table in Section 7 to locate which specific requirements are satisfied.

- b. The VIDS-GT CSC is subdivided into three lower-level CSCs: VIDS_File_Read, VIDS_Init and VIDS_Simul.
- c. Each of the three lower-level CSCs are executed in sequential order. VIDS_File_Read and VIDS_Init are executed only once; VIDS_Simul is executed 15 times a second as part of the M1 code which executes in the Simulate State.

3.2.1.1. VIDS_File_Read CSC

The VIDS_File_Read CSC handles the job of reading a specific text file (VIDS.D) defining the available sensors and countermeasures and the corresponding behaviors. Specific design features include:

- a. This CSC satisfies the requirements for a parameter-driven set of sensor and countermeasure behaviors. Refer to the table in Section 7 to locate which specific requirements are satisfied.
- b. This CSC sequentially reads a specific text file. Each line is either a comment or a keyword-value(s). Comment lines are skipped. Keywords are used to discriminate which values are being read, what format must be used, and where they must be stored.
- c. The text file containing the sensor and countermeasure behaviors is read only once.

3.2.1.2. VIDS_Init CSC

The VIDS_Init CSC handles the job of preallocating dynamic memory, initializing queues, initializing countermeasure rotation CSCs and sending default parameters to the VIDS-PC. Specific design features include:

- a. This CSC does not satisfy any system-level requirements.
- b. This CSC handles the job of preallocating and initializing the dynamic memory to be used during the simulation of the VIDS behavior. Furthermore, it performs a critical initialization step by sending the VIDS-PC a set of default alert, safety, countermeasure coverage, turret scanning sector settings the list of available countermeasures and the inventories of the expendable countermeasures.
- c. This CSC satisfies the design requirements for preallocating and initializing dynamic memory and providing default parameters to the VIDS-PC.

d. This CSC satisfies the design requirements for initializing internal tables used by the CSCs which handle countermeasure rotations.

3.2.1.3. VIDS_Simul CSC

The VIDS_Simul CSC handles the job of managing the majority of other lower-level CSCs. It is these lower-level CSCs which model the behavior of the available sensors, countermeasures and TRM. Specific design features include:

- a. This CSC and its lower-level CSCs satisfy a majority of the system-level requirements allocated to the GT. Refer to the table in Section 7 to locate which specific requirements are satisfied.
- b. This CSC handles the job of sequentially executing lower-level CSCs. These CSCs perform the following functions:
 - 1. Getting updates from the CCDP.
 - 2. Reacting to main and turret power state changes.
 - 3. Determining if there are new threats.
 - 4. Classifying threats based upon what is currently known.
 - 5. Prioritizing the current threats.
 - 6. Selecting countermeasures.
 - 7. Activating countermeasures.
 - 8. Sending updated threat status to the VIDS-PC.
 - 9. Sending countermeasure activation PDUs to other entities participating within the same simulated battle exercise.
 - 10. Managing the rotation of the independent slewing countermeasures.
- c. This CSC satisfies the design requirement for monitoring the main tank and turret power states.

3.2.1.4. VIDS_Shutdown CSC

The VIDS_Shutdown CSC handles the job of terminating the VIDS simulation and sending the final power states to the VIDS-PC. Specific design features include:

- a. This CSC does not satisfy any system-level requirements.
- b. This CSC satisfies the design requirements of formally deallocating the dynamic memory used during the simulation of the VIDS behavior. Furthermore, it prints a summary of the memory usage to the main console.

3.2.2. PC-Resident VIDS CSC

The VIDS-PC CSC handles the job of simulating the CCDP. This includes a set of multi-function buttons as well as the ability to activate audible alarms and display threat information. The display screen is used to portray the type and position of threats relative to the tank. Specific design features include:

- a. The VIDS-PC CSC satisfies all requirements presently allocated to the SMI. Refer to the table in Section 7 to locate which specific requirements are satisfied.
- b. The VIDS-PC CSC is subdivided into 3 lower-level CSCs: SMI_Init, SMI_Simul, SMI_Shutdown.
- c. Each of the three lower-level CSCs are executed in sequential order. SMI_Init and SMI_Shutdown are executed only once; SMI_Simul is executed endlessly until a keyboard Control-C or the right mouse button is depressed.

4. Detailed Design.

The detailed design is divided into two parts. The first part describes the VIDS-GT CSC and the second part describes the VIDS-PC CSC.

4.1 VIDS-GT CSC Detailed Design

4.1.1. VIDS_File_Read CSC

VIDS_File_Read reads a text file (VIDS.D) which defines the list of available sensors and countermeasures and the corresponding behaviors. This CSC is executed only once during the Startup State of the existing M1 code. Furthermore, the text file contains automatic turret rotation rates for each countermeasure, counterfire and turret scanning. The text file also contains the unique identification (VehicleID) of the PC which simulates the behavior of the corresponding CCDP.

Once all the parameters have been read, they are stored in tables. For sensors, this includes coverage angles, range limitation, detection probabilities and reaction/delay times. For countermeasures, this includes the coverage angles, reaction/delay times and in some cases (ROS and Chaff/Flares) launch distances. For the Threat Resolution Module (TRM), this includes the recommended countermeasures and priorities for each threat type.

4.1.2. VIDS_Init CSC

VIDS_Init preallocates dynamic memory structures which are used frequently during the execution of the VIDS_Simul CSC. Preallocation is done here purely for efficiency because VIDS_Init is invoked during a non-critical processing state.

VIDS_Init also sends default settings and expendable countermeasure inventories to the CCDP. This done to allow alert, safety, countermeasure coverage and turret scanning sector settings to be graphically portrayed when the CCDP is powered on.

Finally, VIDS_Init invokes functions which initialize the independently slewing countermeasure rotation tables. During this initialization, slewing countermeasure devices are aligned in the same direction as the main gun.

4.1.3. VIDS_Simul CSC

VIDS_Simul serves as the primary entry point for simulation of the sensors, TRM and countermeasures. It represents the root of a functional hierarchy which is executed once during each execution cycle of the existing, M1

simulation software. During a single execution cycle, the following high-level functions are executed:

```
Get_CCDP_Updates();
React_to_Power_State_Changes();
Identify_Threats();
Manage_Countermeasures();
Send_Updates_to_CCDP();
Send_Updates_to_Network();
Need_To_Release_Turret();
CM_Rotation_Simul();
Poison_Simul();
```

Each of these functions represent a functional sub-hierarchy which is described in the following sections.

4.1.3.1. Get_CCDP_Updates CSU

Get_CCDP_Updates retrieves the current CCDP settings. These settings are changed by user interaction with the touch screen. It is assumed that all error checking is performed by the VIDS-PC. Consequently, all individual values are assumed to be error-free and that combinations of settings are valid.

4.1.3.2. React_to_Power_State_Changes CSU

React_to_Power_State_Changes determines if the VIDS-GT system should continue to respond to sensor input and activate countermeasures. This is done by checking that both the tank Master_Power and Turret_Power are on. Only when they are both on can VIDS be on.

When VIDS is off, internal data structures used to maintain knowledge of threats and active countermeasures are discarded. Later on in Send_Updates_to_CCDP, the VIDS_Power_State is sent to the CCDP so that a similar cleanup can occur on the VIDS-PC.

4.1.3.3. Identify_Threats CSC

Identify_Threats serves as the primary entry point of sensor simulation. Only when VIDS is on is a test is made to determine if there are any new threat reports. For sensors which track threat positions and proximities (NIS and FASR), periodic queries are made to retrieve current threat reports. Each report is sent to Process_Detected_Threat() to determine if the required sensor is available. When the corresponding sensor is available, the threat report is placed into a queue for sensor-specific processing.

Since a threat can be manually deleted at any time, Manual_Threat_Update in invoked to determine if the current CCDP_Control_Settings indicate a

manual threat deletion. When a deletion is indicated, the supplied threat identification is used to search and delete its record from the prioritized threat ...list.

Finally, each new threat report is processed by the corresponding sensor. The required sensor is sent to EO_Sensor_Simul. EO_Sensor_Simul is a generic function which is invoked to model the behavior of a specified sensor.

4.1.3.3.1. EO_Sensor_Simul CSC

EO_Sensor_Simul serves as the primary entry point for simulation of all sensors. This CSC is subdivided into three functional parts: one which simulates reaction delay, one which handles detection probability, and one which processes new threats as a function of sensor-specific coverage limits. The three functional parts are

```
Update_Delayed_Threats();
Process_New_Threats();
Test_Sensor_Coverage_Limits();
```

Each of these functions are described in the following sections.

4.1.3.3.1.1. Update_Delayed_Threats CSU

Each invocation of Update_Delayed_Threats decrements a delay counter associated with each threat in the wait queue. The counter symbolizes the remaining delay time for a given threat. The initial delay time for each threat type is assigned to each threat when it is initially detected in Test_Sensor_Coverage_Limits.

4.1.3.3.1.2. Process_New_Threats CSU

When the counter for a specific threat reaches zero, a detection probability is used by Process_New_Threats to decide if a threat satisfies the probability of detection. A detected threat is moved from the wait queue to the new threats queue. (The new threats queue will be examined later in Fuse_Correlate_Threats). A non detected threat is deleted from the wait queue.

Finally, if the detected threat is a mine, the vehicle brakes are applied immediately.

4.1.3.3.1.3. Test_Sensor_Coverage_Limits CSU

Test_Sensor_Coverage_Limits performs a series of tests to determine if a new threat report is detectable by a specific sensor. The logic of Test_Sensor_Coverage_Limits is constructed to be as generic as possible.

This means that tests for each sensor have been combined into a single set of tests which are applied equally to all threat reports. Differences between individual sensors are handled by a table of sensor behaviors where a given entry contains sensor-specific parameters. Instances where tests are inappropriate for a specific sensor are handled by providing compensating tolerances. For example, the MWS and MFD sensors require a test to determine if the threat is heading towards the tank. For these two sensors, only threats which are approaching the tank within a narrow approach angle are identified as threats. For sensors not requiring an approach angle test, the widest possible approach angle is used (± 180°) so these reports will not be discarded prematurely.

Threat reports which pass the approach angle test are further tested to determine if the threat falls within the current alert sector, and sensor azimuth and coverage sector angles. (The alert sector is one of the CCDP settings and can be changed at any time, whereas the sensor approach, azimuth and coverage sectors remain constant during the simulation.)

To simplify calculations, the threat position is mathematically transformed into the coordinate system of the tank hull. At this point, the relative threat azimuth and elevation angles are computed. If the threat is heading towards the tank and falls within the alert, sensor azimuth and sensor elevation coverage sectors, it is added to the wait queue with the sensor-specific reaction/delay time. Otherwise, the threat report is discarded.

4.1.3.4. Manage_Countermeasures CSC

Manage_Countermeasures serves as the primary entry point for countermeasure simulation. Countermeasure simulation satisfies the requirement to prioritize threats, select appropriate countermeasures and to activate individual countermeasures for each threat. These activities are accomplished by invoking the following functions:

```
Prioritize_Threats();
Select_Countermeasures();
Update_CPS_Coverage();
Individual_CM_Simul();
```

Each of these functions are described in the following sections. Note that Prioritize_Threats, Select_Countermeasures and Update_CPS_Coverage are invoked only when the VIDS power is on.

4.1.3.4.1. Prioritize_Threats CSC

Prioritize_Threats simulates the behavior of the VIDS Threat Resolution Module (TRM). Its primary purpose is to classify threats based upon the

current sensor reports. Furthermore, Prioritize_Threats sorts the threats so countermeasures for the most lethal threats will be activated first. Finally, threats are automatically deleted if no new sensor reports are received within a predefined threat lifetime.

These activities are accomplished by invoking the following functions:

```
Fuse_Correlate_Threats();
Sort_Prioritized_Threats();
Update_All_Prioritized_Threats();
```

Each of these functions are described in the following sections. Note that Sort_Prioritized_Threats is invoked only when the queue of active threats has changed through an addition, update or deletion.

4.1.3.4.1.1. Fuse_Correlate_Threats CSU

The new threats queue built by Process_New_Threats is examined by Fuse_Correlate_Threats to determine if a new threat report supplies additional information for a known threat. When a new report correlates with previous reports (specifically, the SIMNET vehicle identification values match), the new sensor information is consolidated with the previous information. Sensor detection, energy type categories (some sensors like LWR can detect different types of laser energies) and threat platforms are combined into sets; azimuth, elevation and range values are replaced by the current threat report data. Only when a new report better identifies the threat are guise and vehicle type information updated.

When a new report does not correlate with a known threat, the report is added to the prioritized threat queue as a new threat. Furthermore, an alarm warning is queued. The type of alarm warning corresponds to the detecting sensor.

Get_Threat_Classification is invoked for both updated and new threats to return a threat classification. The threat classification is then used by Get_Threat_Priority to return a threat priority.

4.1.3.4.1.2. Get_Threat_Classification CSU

Get_Threat_Classification uses what is currently known about a threat to assign a classification. Threats detected by the NCS or Mine sensor have straightforward classification assignments. However, for the remaining sensors, classifications are based upon moderately complex combinations of sensor reports. Consequently, the following PDL succinctly summarizes the classification strategy:

```
if (Sensor_Reports.MINE) return Class_Mine;
end if
if (Sensor_Reports.NCS)
  return Class_Chemical;
if (Sensor_Reports.MFD)

Class = Class_Muzzle;
if (Sensor_Reports.LWR && Category.LRF)
    return Class_Muzzle_w_LRF;
    if (Available_CMs.TCS)
       return Class_Muzzle_w_TCS;
     end if
end if
if (Sensor_Reports.FASR)
if (Platform_Infantry_Support)
Class = Class = Class_Transrry_Support;
   else if (Platform.Tank)
  Class = Class_Tank;
else if (Platform Helicopter)
     Class = Class_Helicopter;
end if
if (Sensor_Reports.NIS)
Class = Class_Helicopter;
if (Sensor_Reports.TRWR)
   if (Category RADAR_Uplink)
if (Platform.Helicopter)
Class = Class_3; /* AT-6 */
        else
            Class = Class_1; /* AT-2C */
         end if
        if (Platform.Unknown)
Class = Class_6; /* AT-2C or AT-6 */
         end if
        if (Platform Infantry_Support)
Class = Class_Infantry_Support;
         end if
  end if
end if
if (Sensor_Reports.MWS)
Class = Class_9; /* Any ATGM */
    if (!Available_Sensors.LWR & !Sensor_Reports.TRWR)
         Class = Class_7; /* AT-4, AT-9, or AT-11 */
   end if
   if (!Sensor_Reports.LWR)
if (!Available_Sensors.TRWR)
Class = Class_8; /* AT-2C, AT-4, or AT-6 */
else if (!Sensor_Reports.TRWR)
Class = Class_2; /* AT-4 */
         end if
  end if
end if
if (Sensor_Reports.LWR)
if (Category.LDES)
Class = Class_4; /* AT-9 */
   else if (Category.LBR)

Class = Class_5; /* AT-11 */
else if (Category.LRF)

Class = Class_10; /* general threat */
     end if
 end if
 return Class;
```

4.1.3.4.1.3. Get_Threat_Priority CSU

Get_Threat_Priority is a simple function which uses the supplied threat class as index into a table of priorities. The priority for a given threat class is contained in VIDS.D. A copy of VIDS.D is included as Appendix A.

4.1.3.4.1.4. Sort_Prioritized_Threats CSU

Sort_Prioritized_Threats visits each threat in the prioritized threat queue to verify each threat is positioned correctly within the queue. Threats which have activated a countermeasure are placed lower in the queue than threats which have not. A threat which is inside the safety sector is lower in priority than one which is outside. When two threats have equal priority, the one which is closest to the main gun has higher priority. When two threats are equal in angular proximity from the main gun, the one which will be reached first with a clockwise turret rotation has higher priority.

4.1.3.4.1.5. Update_All_Prioritized_Threats CSU

Update_All_Prioritized_Threats visits each threat in the prioritized threat queue to decrement its lifetime. When the lifetime for a threat reaches zero, it is removed. Since this changes the status of the prioritized threat queue, a new prioritized threat message is sent to the CCDP so that the corresponding threat icon will be removed.

4.1.3.4.2. Select_Countermeasures CSU

Select_Countermeasures assigns countermeasures to new threats and reconfirms that the current countermeasure for an existing threat is correct. This is done by visiting each threat in the prioritized threat list and determining if it has been assigned a countermeasure. When a countermeasure has not been assigned, a table lookup is used to find the first available countermeasure. When a countermeasure has been assigned, a table lookup is still performed to confirm that the same countermeasure is still recommended. This is done because the type of threat may have changed due to sensor fusion or because an expendable countermeasure is no longer available. If the recommended countermeasure has changed, the new recommended countermeasure will be activated even if the previous countermeasure has been activated.

Once each threat has been assigned a countermeasure, a check is made to determine if there has been a manual change in the order of countermeasure activation. If the CCDP settings indicate a change, the corresponding countermeasure will be activated first in Individual_CM_Simul.

4.1.3.4.3. Update_CPS_Coverage CSU

Update_CPS_Coverage converts the CPS azimuth coverage sector from the current CCDP control settings and replaces the current CPS azimuth coverage values. The changed azimuth coverage values will be retrieved the next time CPS is activated as a countermeasure.

4.1.3.4.4. Individual_CM_Simul CSU

Individual_CM_Simul controls the activation and deactivation of countermeasures. In general, individual countermeasures are activated and deactivated simultaneously until all threats have been handled. Only when an individual countermeasure is needed to defeat multiple threats is the countermeasure activated sequentially. Furthermore, Individual_CM_Simul supports automatic modes for counterfire rotation and turret slewing.

Countermeasure activation, counterfire rotation and turret slewing can all be activated automatically or semi-automatically. (Semi-automatic activation is equivalent to automatic activation when the commanders thumb switch is engaged.) Countermeasures can be activated manually using buttons on the CCDP, but manual counterfire rotation and turret slewing is still controlled by either the tank commander or gunner controls. Note, however, that all countermeasure activations require arming. A button on the CCDP arms all countermeasures.

Manual countermeasure activation occurs when countermeasures are armed and a countermeasure button is depressed (back lighted) on the CCDP. Electro-optical countermeasure energy is transmitted endlessly until either the corresponding button is released or countermeasures are made safe (disarmed). Manual ROS activation launches a salvo of grenades within the CM Coverage sector. Manual chaff or flares activation launches all expendables at once. Furthermore, manual jamming or a salvo of smoke grenades, chaff or flares can occur concurrently with any mode of turret slewing.

Automatic countermeasure activation occurs when all of the following conditions exist:

- a. the CM mode is automatic or semi-automatic.
- b. the recommended countermeasure for a threat is available.
- c. countermeasures are armed.
- d. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

Furthermore, if a countermeasure requires turret rotation prior to activation, automatic modes for both counterfire rotation or turret slewing are temporarily suspended.

Automatic rotation for counterfire will occur when the following conditions exist:

- a. the CFIRE mode is automatic or semi-automatic.
- b. automatic countermeasure activation has not seized control of the turret.
- c. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

Automatic turret rotation temporarily suspends automatic turret slewing.

Automatic turret slewing will occur when the following conditions exist:

- a. the SCAN mode is automatic or semi-automatic.
- b. automatic countermeasure or counterfire rotation has not seized control of the turret.
- c. the commanders thumb switch is engaged (necessary only for semi-automatic activation).

The following countermeasures are simulated: ROS, MCD, CPS, ATRJ, LCMD, VEMASID, TCS, NBCOP, Chaff/Flares. Furthermore, the radar search energy of the FASR sensor and the forward-looking infrared (FLIR) energy of the MINE sensor are simulated here. However, to simplify their design, countermeasures have been simulated by generic CSUs. Those countermeasures which have similar operating characteristics have been grouped together. The modules and the countermeasures they simulate follow:

- a. ROS_Simul: ROS.
- b. EO_CM_Simul: MCD, CPS, ATRJ, LCMD, VEMASID, the radar search energy of the FASR sensor, and the FLIR energy of the MINE sensor.
- c. TCS_Simul: TCS.
- d. Decon_CM_Simul: NBCOP.
- e. One_Shot_CM_Simul: Chaff and Flares.

Each of these modules are described in the following sections.

4.1.3.4.4.1. ROS_Simul CSU

ROS_Simul serves as the primary entry point for simulation of the Rapid Obscuration System (ROS). This system launches smoke grenades to temporarily hide the tank position from electro-optically guided or terminal homing missile threats.

For simulation, the turret is conceptually divided into 24 equal sectors each with 15 degrees of coverage. Each sector may contain zero or more grenades; and there may be more than one smoke grenade type for individual sectors.

For manual activation, the number and sectors are specified by the CCDP countermeasure coverage sector. Smoke grenades are launched a predefined distance from the tank hull.

For automatic activation, launch sectors are selected dynamically. Launch sectors are selected which require the minimum turret rotations to get the recommended smoke grenades between the threat and the tank hull. Once the turret has rotated a launch sector into position, one or more grenades are launched from adjacent sector positions. Note that if turret rotation is required by ROS, gunner and commander turret controls are disabled; and automatic rotation for counterfire or turret slewing is temporarily suspended.

As grenades are launched, the inventory of available smoke grenades is decremented. Once all the recommended grenades have been launched, the prioritized threat record is updated so that additional smoke grenades will not be launched towards the same threat; gunner and commander turret controls are reenabled; and automatic rotation for counterfire or turret slewing is resumed.

4.1.3.4.4.2. EO_CM_Simul CSU

EO_CM_Simul serves as the primary entry point for simulation of the MCD, CPS, ATRJ, LCMD, VEMASID, the radar search energy of the FASR sensor and the FLIR energy of the MINE sensor. This module simulates systems which direct electro-optical energy towards a threat.

Because of independent slewing, the center of the electro-optical energy is in one of two directions. In manual mode, the countermeasure slews to be coincident with the direction of the main gun; in an automatic mode, the countermeasure slews to angle of the detected threat.

Electro-optical begins when the countermeasure device arrives at the required azimuth angle and when the reaction/delay time has expired. For manual activation, the jamming energy continues until it is manually deactivated. For automatic activation, the electro-optical continues until the predefined jamming time expires. Furthermore, the prioritized threat record is updated so that jamming energy will not be automatically directed against the same threat.

The radar search energy from the FASR sensor begins only when the corresponding CCDP button is depressed and after the reaction/delay time has expired. The center of radar search energy is always aligned with the main gun. Releasing the FASR button immediately terminates the radar search energy.

The FLIR energy from the MINE sensor begins only when this sensor is available and when the reaction/delay time has expired. Since the MINE sensor is not manually activated/deactivated, the FLIR energy continues as long as the tank is operational.

4.1.3.4.4.3. TCS_Simul CSU

The function TCS_is_Not_Effective serves as the main entry point for the TCS simulation. It is invoked by failure_check_cat_kill (found in the m1_failure module) when it is necessary to compute damages from the impact of a missile or main gun round. If TCS is not available as a countermeasure, damage calculations are computed normally. However, when TCS is available a series of tests are performed to determine if the impact should be ignored.

The first set of tests determine if TCS is in a ready mode. TCS is in a ready mode if the following conditions are satisfied:

- a. countermeasures are armed, and
- b. the CM mode is automatic, or the CM mode is semi-automatic and the commanders thumb switch is engaged, or
- c. the CM mode is manual the TCS button is depressed.

If the TCS is in the ready mode, the final set of tests are performed. Conceptually, the hull is divided into quadrants: front right, front left, rear left, rear right. The direction of the velocity vector of the projectile with respect to the hull orientation is used to derive which quadrant's inventory must be examined. If the quadrant's inventory is not depleted, the inventory is reduced by one and TCS has saved the tank crew from a catastrophic kill.

4.1.3.4.4.4. Decon_CM_Simul CSU

Decon_CM_Simul and Poison_Simul serve as the primary entry points for simulating the NBCOP. Identify_Threats registers when a poison is present regardless of the availability of NCS by invoking Contaminant_Exists. When poison is present, Poison_Simul decrements a life-expectancy timer. A catastrophic kill is initiated when the timer expires.

Decontamination begins when the following conditions are satisfied:

- a. countermeasures are armed and,
- b. the CM mode is automatic, or the CM mode is semi-automatic and the commanders thumb switch is engaged, or
- c. the CM mode is manual and the NBCOP button is depressed.

For manual activation, the decontamination continues until it is manually deactivated. For automatic activation, the jamming continues until the predefined jamming time expires.

4.1.3.4.4.5. One_Shot_CM_Simul CSU

One_Shot_CM_Simul serves as the primary entry point for Chaff and Flares countermeasure simulation. This module launches chaff or flares to decoy radar directed or infra-red guided/directed missiles and munitions.

Because of independent slewing, the final azimuth launch angle is in one of two directions. In manual mode, the countermeasure slews to be coincident with the direction of the main gun; in an automatic mode, the countermeasure slews to azimuth angle of the detected threat.

Chaff or flares are launched as soon as the countermeasure device arrives at its prescribed angle and when the reaction delay time has expired. For automatic activation, the prioritized threat record is updated so that other countermeasures will not be automatically directed against the same threat. Furthermore, once chaff or flares are launched, the entire chaff or flares inventory is considered to be depleted.

4.1.3.4.4.6. CFire_Simul CSU

CFire_Simul serves as the main entry point of automatic turret slewing for counterfire. This module rotates the turret to aim the main gun in the direction of a threat.

As automatic turret rotation begins the gunner and commander turret controls are disabled. Once the main gun is positioned to the threat azimuth angle, gunner and commander turret controls are reenabled.

As a final note, the main gun is never fired automatically.

4.1.3.4.4.7. Turret_Scanning_Simul CSU

Turret_Scanning_Simul serves as the main entry point of automatic turret slewing. This module rotates the turret within the turret scanning sector.

As automatic turret rotation begins the gunner and commander turret controls are disabled. Only when automatic turret scanning is disabled are the gunner and commander turret controls reenabled.

4.1.3.5. Send_Updates_to_CCDP CSC

Send_Updates_to_CCDP serves as the primary communication channel for sending information updates from the VIDS-GT to the VIDS-PC. The following types of information are sent:

- a. changes to the top ten threats.
- b. changes to hull or turret orientations.
- c. changes to master or turret power states.
- d. audible alerts for new or changed threats.
- e. changes in expendable countermeasure (ROS, TCS, Chaff/Flares) inventory.

Services provided by existing code are used to package and transmit the messages to the corresponding VIDS-PC.

4.1.3.6. Send_Updates_to_Network CSC

Send_Updates_to_Network serves as the primary communication channel for sending the state of the VIDS-equipped tank to other entities participating within the same simulated battle exercise. The following types of informational messages are sent:

- a. the presence of smoke, chaff or flares.
- b. the activation/deactivation of electro-optical energy.
- c. instrumentation (used only for data collection and analysis).

Only instrumentation messages are sent at regular intervals. However, an instrumentation message will be sent sooner if one of the following conditions exist:

- a. the state of the Master or Turret Power changes.
- b. the state of the commander's thumb switch changes.
- c. the number of threats exceeds the maximum number of displayable icons on the CCDP.
- d. turret control is seized or released by VIDS.

Services provided by existing code are used to package and transmit the information to other entities.

4.1.3.7. Need_To_Release_Turret CSU

Need_To_Release_Turret provides a safeguard to release turret control when no threats are present and CM, CFIRE and SCAN modes are in manual.

4.1.3.8. CM_Rotation_Simul CSC

CM_Rotation_Simul supports the need for independently slewing countermeasures. Furthermore, it manages conflicting rotation requests using priorities.

Each independently slewing countermeasure corresponds to an entry in the countermeasure device table. For each invocation of CM_Rotation_Simul, individual countermeasure devices are rotated to the next position by adding the device rotation rate to the current position. The rotation rate can be positive or negative to move a device in a specific angular direction. Because all simulated devices (except VEMASID) are mounted to the turret, hull and turret rotations can accelerate or retard the time required to move a device to a specified angle. However, once the device has arrived, it remains perfectly positioned until a higher priority request is received.

Conflicting requests to rotate a specific countermeasure are handled using priorities. The priority of each countermeasure rotation request is compared to the previous rotation request. Lower priority requests are ignored. A request with equal or higher priority than the current priority takes control of the countermeasure device. The new priority replaces the current priority.

4.1.3.9. Turret_Rotation CSC

Start_Turret_Rotation and Stop_Turret_Rotation serve as the main entry points for automatic turret rotations required by ROS_Simul, CFire_Simul and Turret_Scanning_Simul. Like CM_Rotation_Simul, rotation requests are based upon a priority.

Conflicting requests to rotate the turret or stop the current rotation are handled using priorities. The priority of each turret request is compared to the previous request. Lower priority requests are ignored. A request with greater than or equal to the current priority takes control of the turret. The new priority replaces the current priority.

Start_Turret_Rotation is invoked to initiate automatic turret rotation. The minimum rotation direction is computed using the current and final turret positions when the request satisfies the priority test. The direction is used to compute the sign of the turret rotation increment. It is this increment which is used to modify the current turret position during each execution cycle.

Stop_Turret_Rotation is invoked to terminate automatic turret rotation. Only when the request satisfies the priority test is the automatic turret rotation terminated.

4.1.3.10. VIDS_Shutdown CSC

The VIDS_Shutdown CSC handles the job of shutting down the VIDS simulation. The local Master and Turret Power states are cleared and the final power state message is sent to the CCDP. This has the net effect of forcing the CCDP to redisplay the initial (power off) menu.

Each internal queue is examined and each member is formally deallocated. Once this is complete, memory statistics are written to the main console. The statistics can indicate if there is a memory management problem or if additional memory should be preallocated during the earlier execution of VIDS_Init.

4.1.4. XField CSC

XField handles the low-level simulation of electro-optical energy. XField PDUs retrieved from the network are examined to determine the kind and spatial extent of electro-optical energy. If the VIDS-equipped tank falls within the energy field, the information describing the field is added to an internal list of other fields. Additionally, the presence of clouds (smoke) is used to determine if the field energy is absorbed. If field energy is absorbed, the field is not made available to the higher-level Identify_Threats CSC.

Fields are removed from the list when either an explicit XField PDU defines that the field no longer exists or the specified field lifetime expires.

An XField PDU sent by the VIDS-equipped tank (refer to the EO_Sensor_Simul and One_Shot_CM_Simul CSUs) is tagged appropriately to distinguish it from fields sent by other vehicles. Furthermore this type of field is periodically retransmitted to the network as long as the field is present.

4.1.5. Cloud CSC

Cloud handles the low-level simulation of electro-optic energy absorbing smoke clouds. Smoke Cloud PDUs are initially transmitted to the network by VIDS-equipped tanks (refer to the ROS_Simul CSU) to inform other vehicles that new smoke clouds exist.

Each smoke grenade is simulated as a single cloud. Parameters are supplied which define the smoke type and corresponding spatial dynamics. This allows other vehicles to model the smoke growth, dissipation and interference with electro-optical energy.

Like XFields PDUs, Cloud PDUs are periodically retransmitted to the network as long as the smoke is potentially effective as an obscurant. When the smoke from a grenade is no longer effective, a Cloud PDU is transmitted to the network so that other vehicles can drop it from their internal lists.

4.1.6. Modifications to Existing Code

Modifications to existing code were made to support the VIDS-GT capability. The files and changes follow:

a. m1 main.c

Added invocation of VIDS_Init in the veh_spec_init function.

Added invocation of VIDS_File_Read in the veh_spec_startup.

Added invocation of VIDS_Simul in the veh_spec_simulate.

Added VIDS_Shutdown to the veh_spec_exit to send a

TankPowerStateVariantmsg to the CCDP to turn it off.

Added a test to determine if the engine was running before invoking VIDS_Simul() to support the NIS-unique detection and identification probabilities.

Made changes to access new idc_value array element which holds the state of the new commander's thumb switch.

Inserted field_tick and cloud_tick before VIDS_Simul.

b. m1 turret.c

Added the set_vids_az function to support automatic turret rotations to specific azimuth angles.

Added the set_vids_relative function to support final turret angles relative to the tank hull.

Added the set_vids_north function to support final turret angles relative to true north.

Added the set_vids_auto_on function to disable the gunner and commander turret rotation controls.

Added the set_vids_auto_off function to enable the gunner and commander turret rotation controls.

Added the set_vids_slew_rate function to support the specification of a rotation rate.

Added the get_vids_rate function to retrieve the current, VIDS-specific turret rotation parameters.

c. proc_a_pkt.c

Added code to recognize and reformat VIDS (CCDP Control Settings) PDUs.

Added code to recognize ROS, TCS and Chaff/Flares munition resupply PDUs so the initial supply and placement of expendable countermeasures could be instantly restored.

d. m1_ctl_tpc.c

Made changes to support the use of a new commander's thumb switch which will be used instead to activate semi-automatic CMs.

e. m1_failure.c

Added the TCS_is_Not_Effective function to intercept a fatal impact from a missile or projectile.

f. m1_resupp.c

Added code to recognize the ROS, TCS and Chaff/Flares variants of the munition resupply PDU and invoke the corresponding CSC resupply functions.

g. read_pars.c:

Added code to recognize and store the name of the VIDS parameter file.

Added get_vids_data_file to return the name of the VIDS parameter file.

4.2. VIDS-PC Detailed Design

4.2.1, SMI_Init CSC

SMI_Init preallocates dynamic memory structures associated with drawing menus and icons which will be displayed during the execution of the SMI_Simul CSC. Data files are read which define the placement and appearance of buttons and icons as well as the unique identifier (VehicleID) of the corresponding GT. Parameters are read which define active buttons and how long they must be pressed for a corresponding action to be activated. VIDS (Default Sector Setups and Expendable CM Inventory) PDUs sent by the corresponding GT supplies initial values for the alert, countermeasure, safety, scanning and CPS coverage sectors, the list of available sensors and countermeasures and the inventory of the expendable countermeasures. The list of available countermeasures is used assign spare buttons to individual countermeasures. Finally, links are established between buttons and function invocations.

4.2.2. SMI_Simul CSC

SMI_Simul serves as the primary entry point for simulation of the real CCDP. It represents the root of a functional hierarchy which is executed endlessly until a keyboard Control-C or right mouse button event is received. During a single execution cycle, the following high-level functions are executed:

```
Get_Button();
Check_Alarms();
Process_Rcv_PDU();
```

Each of these functions represent a functional sub-hierarchy which is described in the following sections.

4.2.2.1. Get_Button CSU

Get_Button serves the need to monitor button, mouse, and keyboard activity. A right mouse button or keyboard Control-C signals a request to terminate

the SMI_Simul CSC by transitioning to SMI_Shutdown. Otherwise, a test is made to determine if a displayed button has been held down. If a button has been held down long enough and it corresponds to a predefined action, the action is initiated through a corresponding function call. The corresponding function may change the current menu, the content of the display, the operating state or a combination of these changes. When a button changes one of the VIDS operating states, a network message is sent to the VIDS-GT to update its corresponding CCDP settings Additionally, when any button state is changed or when a user alert message is displayed, an instrumentation message is sent to the network for data collection and analysis.

4.2.2.2. Check_Alarms CSU

Check_Alarms manages the VIDS alarm tones heard on the tank intercom. The status of each alarm type is checked to determine if it should be activated or terminated. When an alarm is activated, the alarm is heard for a predefined duration. An alarm is terminated when the duration has expired, a termination message was received from the GT or VIDS is powered off.

4.2.2.3. Process_Rcv_PDU CSC

Process_Rcv_PDU manages received network messages. Only messages sent by the corresponding VIDS-GT are processed. All other messages are discarded.

Depending upon the type of message, the display or alarm tones are changed. The message types which change the display include the following:

- a. Tank Power State updates.
- b. Tank Orientation updates.
- c. Prioritized Threat updates.
- d. Automatic CM Activation/Deactivation updates.
- e. Default Setups.
- f. Changes to the inventory of expendable countermeasures.

Only the Alarm Control message type affects what is heard on the tank intercom. Refer to the IDD in section 5 for the exact content of each message type.

4.2.3. SMI_Shutdown CSU

SMI_Shutdown releases memory allocated during SMI_Init and restores the mouse and display behaviors before terminating.

5. CSCI data.

Within the VIDS-GT CSC, there is only one global data element: vids_debug. It a Boolean object which is toggled between two states to either activate or deactivate diagnostic messages. Under normal conditions, vids_debug is false.

Within the VIDS-PC CSC, the following arrays represent global elements:

- a. Icon.
- b. Threat.
- c. Frame.
- d. Display.
- e. Vary.
- f. Buttons.
- g. fcnptrs.

These arrays used to support low-level drawing operations. Refer to the following header files for more details:

global.h alarm.h buttons.h

The following table lists the type and content of the messages exchanged between the PC, GT and SAF. Additionally, the content of the GT and PC instrumentation messages are included.

	Defines the start angle of the atert sector. The start angle is defined relative to the front of the full. Positive angles are counterclockwise. Threats which fall cutaids alert sector will be formed.	Defines the angular offset from the start angle. The sector defined by the detta from the start angle is evenly divisible by 15 degrees. If Delta equals zero, threats will not be reported.	Defines the start angle of the safety sector. The start angle is defined relative to the front of the hult. Positive angles are counterclockwise. Neither the lurret nor any CM will be activated within the Safety Sector.	Furthermore, the turnet will not be automatically slewed into this sector for either Semi or Auto CFire.	Defines the angular offset from the start angle. The sector defined by the dolla from the start angle is evenly divisible by 15 degrees.	If Dolta equials 0, then no safety region is defined. In other words, countermeasures can be activated/deployed in any direction.	Defines the start angle of the turret scanning sector. The start angle is defined relative to the front of the hult. Positive angles are counterclockwise.	Delines the angular offsel from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.	If Delta equals 0, then turnet scanning is disabled.	Defines the start angle of the CM coverage sector. The start angle is defined relative to the front of the hilf. Positive angles are counterclockwise.	Defines the angular offset from the start angle. The social defined by the dotte from the start angle is evenly divisible by 15 degrees.
All Van	0 to 360 degrees.	0 to 360 degrees.	0 to 360 degrees.		0 to 360 degrees.		0 to 360 degrees.	0 to 360 degrees.		0 to 360 degrees.	0 to 360 degrees.
si por isi	.Start_Angle	. Delta	.Start_Angle		.Delta		.Start_Angle	.Delta		.Start_Angle	.Della
	.Alert_Sector		.Safety_Sector				.Turrel_Scanning_Sector			.CM_Coverage_Sector	
CCDP_Control_Settings (sent from CCDP to M1)											

If Delta equate 0, then no emole grenades will be fired by a Manuel Salvo. A sector defined by Delta which is greater than 0 defines the coverage of amole grenades when the Salvo builton is degreesed in Manuel ander	Definee the start angle of the CPS coverage sector. The angle is defined to be relative to the main gun. Positive angles are counterclockwise.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 5 degrees.	Defines an array which stores the number of smoke grenades to faunch for each type of grenade. Smoke grenade type (LBA1, M76, XM81) is used to index into the array. Each array element contains the number of premarates to taunch	Defines wheller VIDS is on or off. When VIDS is off, only the Salva and Arm Salva Buttons occurs.	Defines the turnet acanning mode. The turnet mode will return to Menual II manually deactivated, or if a tuent is intended and of the turnet of turnet	Defines the counterfie mode. Serni or Auto provide for airbranks included and inclu	Defines the comfermensine mode. Some and Auto provide for automatic hirrel slewing and automatic CM activation.	Defines the ArmSale hutton state. The state must be Armed before any countermeasure is activated. This state is innered for all CEIN and Turne Countermeasure.	Delines the ROS countermeasure state. The ROS countermeasure may be activated manually or automatically. Manually deactivating the ROS countermeasure immediately terminates either type of activation. Otherwise deactivation occurs after the	recommended number of smoke grenades have been launched.	Defines the MCD countermeasure state. The MCD countermeasure may be activated manually or automatically. Manually deactivating the MCD countermeasure immediately terminates either type of	activation. Manual activation always requires manual deactivation; automatic deactivation follows automatic activation after a predefined delay.
Sent de la Company de la Compa	0 to 360 degrees.	5 to 120 degrees.	!	Oil, On	Markal, Semi, Auto	Manual, Semi, Auto	Mawial, Sorni, Auto	Sale, Armed	Deactivated, Activated		Desclivated, Activated	
S S	.Start_Angle	Delta										•
Field	.CPS_Coverage_Sector		.Manual_Grenade_Salvo	.VIDS_Power_State	. Turret_Mode	.CFire_Mode	.CM_Mode	Arm_Safe_Stato	.ROS_Button_State		.MCD_Button_State	
Surface Surfac												

	Defines the Flares countemeasure state. The Flares countemeasure state. The Flares countemeasure state. The Flares countemeasure may be activated menually or automatically. Menually descrivating the Flares countermeasure immediately terminates either type of activation. Otherwise, descrivation occurs after the entire inventory of flares has been launched.	Defines the LCMD countermeasure state. The LCMD countermeasure may be activated manually or automatically. Manually descrivating the LCMD countermeasure immediately terminates either type of activation. Manual activation always requires manual deactivation; automatic deactivation follows automatic	activation street a precented delay. Defines which target to be deleted. A value of 0 means that no manual detellors are required.	Defines which target is the top priority. A value of 0 means that no cleargo is required.	Defines an array of bits which is indexed by LBR, LDES, LRM, ATGM, HELO, TANK. When a bit is set to 1, sensed threats of the specified type will be ignored.	Defines an array of bits which is indexed UNKNOWN, FRIEND, FOE. When a bit is set to 1, identified threats of the snertified bare will be browned.	ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, The bit map is indexed by CM type. Each array element defines which CM can be automatically activated.		Defines the Master Power State. When this is Off, no CCDP button can be "depressed", all lights go out, the display is blanked, and any audible warning tone is terminated.	Delines the Turret Power Stale. When this is Off, no CCDP button can be "depressed", at lights go out, the displey is blanked, and any audible warning tone is terminated.
Dante of Vation	Descrivated, Activated	Deactivaled, Activated	SIMNET Vehicle Id	SIMNET Vehicle Id	LBR, LDES, LRF, ATGM, HELO, TANK	UNIGNOWN, FRIEND, FOE	ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD NBC, Chaff_Flares, LCMD		uo jio	Oif, On
Sept. Park										•
F.8.78	Flaros_Button_State	.LCMD_Button_State	.Delete_Threat	.Selected_Top_Threat	. Threat_Sensor_Filler	.Gulse_Filler	.Auto_Activated_CMs		.Masier_Power_State	.Turrel_Power_State
Structure								Tank_Power_State sent from M1 to CCDP)		

DA. structure	Fiotis	Suth-Totris	Carrye of Valuos	Descriptions
(sent from M1 to CCDP)				
	.Hutt_Orientation		0 to 360 degrees.	Defines the angle of the hull with respect to true North.
	.Turret_Orientation		0 to 360 degrees	Defines the angle of the lurret with respect to the hulf. Positive angles are counterclockwise.
Expendable_CM_inventory (sent from M1 to CCDP)				
	.ROS_Launch_Tubes		[3,24]	Defines an array of smoke grenade lotals. The first array element is indexed by L&A1, M76, XM81. Each array element contains the remaining grenades of the specified byte in the 24 launch habe.
				The second array element corresponds to the launch tubes. For simulation, each launch tube is positioned at 15 degree increments with an initial offset of 7.5 degrees from the main gun.
				Note, each tube can launch one of three types of grenades: LBA1, M76, XM81. Grenades can be launched in any order from a cinylated tube.
	.Nemaining_ROS_Grenades		(3)	Provides a subtotal of remaining grenade types.
	.ROS_Grenade_Angles		[24]	Defines the grenade launch angles. These are used to display smoke grenade icons on the CCDP.
	.Fired_ROS_Grenade_Count		0,24	Defines the number of grenade angles and ultimatery the number of smoke grenade from to display on the CCDP.
	.TCS_Launch_Tubes		[4]	Defines an array of 4 launch tubes where each tube holds 2 expendable TCS CMs.
	.Remaining_TCS			Provides the remaining inventory of TCS.
	.Remaining_Chaff		0,30	Defines the remaining inventory of chaff.
	.Remaining_Flares		0,30	Defines the remaining inventory of decoy flares.
Alarm_Control (sent from Mf to CCDP)				
	.Alarm_index		1-255	Defines the index into a prerecorded table of atarm tones.
	.Alarm_Activation		Oif, On	Defines when the tone is played or terminated

DA STRICKE	Flekts	SubFields	Aange of Values	Descriptions
	.Alarm_Duration		09 • 0	Defines the number of seconds that a warning tone must be beard
Prioritized_Threats				
(sent from M1 to CCDP)				
	.Total_Threat_Count		0.65535	Defines the number of recognized threats. Note that only the first 10 threats will be sent to the CCDP, and that the threats will be seen in profess.
	.Threat_List	.Threat_Type	TANK, SUPPVEH, NBC, UPLINK, SEARCH, TRACK, AHEA, OHSBD, HAVOC, HIND, HIP	Identifies the type of threat.
		.Vehicle_id	SIMNET Vehicle Id	Uniquely defines the threat
		.Azimuth_Angle	0 to 360 degrees	Defines the angle of the threat with respect to true North. Positive angles are counterchockwise
	•	.Elevation_Angle	90 to -90 degrees	Defines the angle of the threat with respect to the horizon. Positive angles are above the horizon.
		.Range	0 - 10km	A subset of the sensors report a threat distance.
		.Guise	Friend Foe, Unknown	Defines if the threat is friendly. For the present all, threats are foes.
		.Recommended_CM	NULL, MCD, FIOS, CPS, CMINE, ATRJ, TCS, NBCOP, CHAFF, F. CARES, LCMD	Defines the recommended CM for automatic activation.
		.ROS (variant)	.Grenade_Type_Array	Defines an array of smoke grenade types. For ROS, the three types are LBA1, M76, XM81. Each array element defines the number of smoke grenades to launch for a given threat.
Auto_CM_State_Change (sent from M1 to CCDP)	.CM_States_Array		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chall_Flares, LCMD	ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, The array is indexed by CM type. Each array element defines which builcovidisplay to light/extinguish when a countermeasure is automaticaty activated/deactivated
		.State	Deactivated, Standby, Activated	Defines the automatic activation state of a specific CM. Standby indicates the reaction/delay time period prior to actual activation.
Default_CCDP_Setupe (sent from M1 to CCDP)				
	.Alert_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the alert sector. The start angle is defined relative to the front of the hult. Positive angles are counterclockwise. Threats which fall outside alert sector will be iconcred.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible to 15 decrease.
	.Salety_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the salety sector. The start angle is defined relative to the front of the hult. Positive
				angles are counterclockwise. Neither the turret nor any CM will be activated within the Safety Sector.

Simeture	Fieds	SubFields	(Jange or Values	
		Dolla	0 to 360 degrees.	Defines the angular clast from the start angle. The sector defined by the delta from the start angle is everally
				If Delta equals 0, then no salety region is defined. In other words, countermeasures can be activated/deployed in any direction.
- -	Turrel_Scanning_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the turret scanning sector. The start angle is defined to be relative to the front of the built. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Delines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 15 degrees.
	•			If Delta equals 0, then furrel scanning is disabled.
J.	CM_Coverage_Sector	.Start_Angle	0 to 360 degrees.	Defines the start angle of the CM coverage sector. The start angle is defined relative to the front of the hull. Positive angles are counterclockwise.
		.Delta	0 to 360 degrees.	Defines the angular offset from the start angle. The sector defined by the delta from the start angle is evenly
				If Delta equals 0, then no smoke grenades will be fired by a Manual Salvo. A sector defined by Delta which is present the coverage of smoke grenades.
9.	CPS_Coverage_Sector	.Slart_Angle	0 to 360 degrees.	Defines the start angle of the CPS coverage sector. The angle is defined to be relative to the main gun. Positive angles are counterclockwise.
		.Delta	5 to 120 degrees.	Defines the angular olfset from the start angle. The sector defined by the delta from the start angle is evenly divisible by 5 degrees.
Ψ.	.Manual_Grenade_Salvo		[8]	Defines an array which stores the number of smoke grenades to faunch for each type of grenade. Smoke grenade type (LBA1, M76, XMB1) is used to index into the array. Each array element contains the number of grenades to faunch.
1.3	.Available_CMs		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, Defines a bit map indexed by CM type. Each erray element defines which CM is available for either menual or automatic activation.
	.Auto_Activated_CMs		ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, NBC, Chaff_Flares, LCMD	ROS, MCD, CPS, VEMASID, ATRJ, TCS, MFD, Delines a bit map indexed by CM type. Each erray NBC, Chaff_Flares, LCMD element defines which CM can be automatically activated.
	Available_Sansors	,	I.WT, MWS, MFD, SEISMIC, NIS, NCS, TRWR, FASR	Defines a bit map indexed by Sensor type. Each array element defines which Sensor is available for manual activation. Presently, this is used only for FASR.

Med_1D	0 to 65535 D SINNET Vehicle Id Position Based_On_Vehicle_Huil, Rotation_Based_On_Vehicle_Huil, Rotation_Based_On_Vehicle_Puhil Rotation_Based_On_Vehicle_Puhill Rotation_Based_On_Vehicle_Puhill Rotation_Based_On_Vehicle_Pu
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	theta sweep amplitude		0.0 to maximum floating policy to the	Defines the frequency in Hertz for the theta dynamics to complete a cycle.
			R	Defines the frequency in Hertz for the theta dynamics to
	.phi_sweep_frequency		0.0 to maximum floating point number.	complete a cycle.
				Defines the frequency in Heriz for the theta dynamics to
	. Dun Sweep_amplinde		U.U to maximum tioating point number.	соприн в сусте.
	.radius		0.0 to maximum floating point number.	Defines radius of the field at the source.
	¥.			For future simulations.
Cloud				
(sent by vius-equipped (vehicles)				
	location		SIMNET WorldCoordinates	Defines the location of the smoke cloud in the
			An array of 3 floating point rates.	Defines the rate (meters/second) at which a closs!
	. drift			moves from its origin.
	еде.		0 to maximum floating point number.	Defines the age of the smoke cloud
	lype		Visual_Obscurant, Visual_IR_Obscurant, Millimeter Wave Obscurant	Defines the energy absorbing properties of the cloud.
VIDS-GT Instrumentation (sent to the Data Logger)				
	VehicleID		SIMNET Vehicle id	Defines which vehicle issued the instrumentation PDU.
			0 to 10	Defines the number of available threats in the
	.Sensor_Count			Avail_Sensors array.
	.Sensors		(10)	Each element uniquely defines the available sensor.
			[10]	Each element defines the accuracy of the corresponding
	Sensor_Accuracy			sensor.
			released, depressed	Defines the current state of the Commanders Control
	.CCH_Ihumb_Switch			Handle thumb switch.
	. Turret_Controlled_by_VIDS		false, true	Defines if VIDS has seized control of the turret.
	Excess Threats		0 to 255	Defines the number of detected threats but not currently displayed on the CCDD
				anional asparage of the coor
VIDS-PC Instrumentation				
(sent to the Data Logger)				
	.VenicielD		SIMNET Vehicle id	Defines which vehicle issued the instrumentation PDU.
	.EventID		SIMNET Event id	Defines the unique identification number of the POU.
	.Button		0 to 255	Defines which button is changing state.
	.Menu		0 to 255	Defines which menu the button is an.
	New Menu		0 to 255	Defines which menu will be displayed next.
	.Button_State		released, depressed	Defines the state of the button.
				Holds a copy of the alert message displayed on the
	.Alert_Msg		[21]	CCDP. The string is null terminated.

6. CSCI data files.

Files are not shared between VIDS CSCs or CSUs.

7. Requirements traceability.

The following table depicts the requirements traceability. The requirements are grouped into sections representing incremental refinements. For example, requirements beginning with the number 1 signify Phase 1 requirements; requirements beginning with the number 2 signify Phase 2 requirements.

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1	The Turret Pointer indicating the direction in which the main gun is pointing. Top of display means same as front of hull.	The I tull Pointer indicating the top of the display.	The Programmable Turrel Limits delineating the limits of SCAN.	The Menu Choice Field indicating the current function represented by each of the PFKs. When a PFK is selected the corresponding field shall be back lighted on the display.	The control panel shall contain fourteen Fixed Function Keys (FFKs) suitable for controlling the use of the VIDS. Sufficient functionality shall be provided to allow the following actions. Unused FFKs shall be labeled "SPARE". Activating SPARE or any illegal action shall result in a User Alert.	POWER - Control whether VIDS is in the Off as opposed to the other Operational Modes. When power is Off none of the PFKs and only the ARM/SAFE and SMOKE GRENADE LAUNCH (SALVO) actions are functional. Transition out of Off Mode is to Manual, the top level ment is shown, and all setups are at default values.	ARM/SAFE - Allows/Disallows use of CM. If VIDS is Off Allows/Disallows use of smoke grenedes. Activation of any CM is disallowed when it is in the SAFE condition and will result in a User Alent.	SMOKE GRENADE LAUNCH (ROS) - When VIDS is Off this FFK dispenses 4 smoke grenades centered around the fine o sight of the main gun. When VIDS is Manual this FFK dispenses Setup selected (or initial default) number and type of grenades. This capability is lifegal if system is in SAFE condition (a User Alort results).	MAIN - Puts up the top level menu and sets VIDS to the Manual Mode. Any setup actions are preserved.	ENTER - Activates previous PFK selection. If no PFK is selection. If no PFK is selected menu goes up one level. Attempts to go up from the top menu will result in a User Alort.	<u>8</u>
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	die.	讀	5	물등률	ontr y st (s s	POWER - Control whether VIDS is in the OI the other Operational Modes. When power PFKs and only the ARM/SAFE and SMOKE LAUNCH (SALVO) actions are functional. Transition out of Off Mode is to Manual, the shown, and all setups are at default values.	S O E	SMOKE GRENADE LAUNCH (FFK dispenses 4 smoke grenar sight of the main gun. When VI dispenses Setup selected (or in of grenades. This capability is I condition (a User Alert results).	중	19 Ch	TANGET SELECT - Causes the currently so deleted and the next highest to be selected.
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1.1.1.3.7.	SCROLL UP - Selects the next highest priority larget without deleting the current. Attempts to select UP from the highest will result in a User Alert.												7
1.1.3.8.	SCROLL DOWN - Selects the next lowest priority target without defeling the curret. Attempts to select DOWN from the lowest will result in a User Alert.												
1.1.1.3.9. (revised for phase 2)	MCD - Used in the Manual Mode to activate the MCD system. If system is in SAFE condition a User Alert results.												Τ
1.1.1.3.10. (revised for phase 2)	CM OFF - Pressing ROS or MCD while they are active manually deactivates the CM.												
	The control panel shall contain five Programmable Function Keys (PFKs) for use in changing VIOS states, menu selection and/or traversing, and performing Setup functions. PFK selections will not be activated until the ENTER function is activated. The top level menu shall offer a choice between NORM (fight life war) and SETUP.												
1.1.4.1.	NORM - Provide for placing SCAN, CM, antifor Counterfire into the Semi-Automatic or Automatic Mode as described in CBVIDS-004 (modified by follow-up data).												L
1.1.1.4.2.	SETUP - Provide Setup Menus and actions compatible to that described in CBVIDS-004 where possible. Sensor Simulations. VIDS Step 2 will simulate the Laser Warning Receiver (LWR) and the Missile Warning System												
1.1.2.1.	(MWS). Each sensor simulation shall: Monitor the exercise to determine the occurrence of any activity which can be sensed.							#					
1.1.2.2.	Apply processing and response times to simulate realistic sensor reaction.										=		
1.12.3.	Apply probability of defection numbers to the sensed entity to simulate the sensor's effectiveness.												
· .	what this sensor knows about it for further VIDS processing.												
1.1.2.5.	Mantain sensor characteristics such as processing time and probability of detection as parameters so that they may be easily modified before an exercise.												

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₹	asure Simulations. The VIDS Step 2 will simulate alvo Smoke Grenade Launcher / Rapid Obscuration OS) and the Missile Countermeasure Device	imulation shall:	of deploying any of the three types of smoke as he VIDS Functional Specification. When I requires turret motion deployment shall delay until positioned.	maintain for each smoke deployment the boation the volume of the smoke screen created for the vation of the smoke screen. Communicate the nd characteristics of this smoke screen to all in the exercise.	appropriate visual effect for the smoke screen being and communicate to all participants in the exercise.	imutation shall be capeble of deploying an IR as defined in the VIDS Functional Specification inicaling the presence and characteristics of this articipants in the exercise.				retailon of newty disclosed data with data from sclosures.	5	ا ر ا	odge of sensod entities to prioritize threats.
₹ -	measure Simulations. The VIDS Step 2 will simulate i-Salvo Smoke Grenade Launcher / Rapid Obscuration (ROS) and the Missile Countermeasure Device	S simulation shall:	able of deploying any of the three types of smoke as in the VIDS Functional Specification. When tenties turnet motion deployment shall delay until it is positioned.	and matritain for each smoke deployment the location flective volume of the smoke screen created for the transform of the smoke screen. Communicate the e and characteristics of this smoke screen to all with in the exercise.	an appropriate visual effect for the smoke screen being at and communicate to all participants in the exercise.	D simulation shall be capeble of deploying an IR field as defined in the VIDS Functional Specification imunicating the presence and characteristics of this Il participants in the exercise.				correlation of newly disclosed data with data from i disclosures.	5	ا ر ا	wiedge of sensed entities to prioritize threats.
₹	measure Simulations. The VIDS Step 2 will simuli- it-Salvo Smoke Grenade Launcher / Rapid Obscur (ROS) and the Missile Countermeasure Device	ROS simulation shall:	apable of deploying any of the three types of smoke as sed in the VIDS Functional Specification. When syment requires turret motion deployment shall delay until uret is positioned.	te and matritain for each smoke deployment the boation e effective volume of the smoke screen created for the tive duration of the smoke screen. Communicate the ence and characteristics of this smoke screen to all inhe exercise.	te an appropriate visual effect for the smoke screen being rated and communicate to all participants in the exercise.	MCD simutation shall be capeble of deploying an IR ning field as defined in the VIDS Functional Specification communicating the presence and characteristics of this to all participents in the exercise.				orm correlation of newly disclosed data with data from ous disclosures.	5	ا ر ا	krowlodge of sensed entities to prioritize threats.
₹	measure Simulations. The VIDS Step 2 will simuli- it-Salvo Smoke Grenade Launcher / Rapid Obscur (ROS) and the Missile Countermeasure Device	he ROS simulation shall:	e capable of deploying any of the three types of smoke as efined in the VIDS Functional Specification. When sployment requires turret motion deployment shall delay until e turret is positioned.	ititate and mutitation for each smoke deployment the bication. The effective volume of the smoke screen created for the flective duration of the smoke screen. Communicate the esence and characteristics of this smoke screen to all writipants in the exercise.	itiale an appropriate visual effect for the smoke screen being snerated and communicate to all participants in the exercise.	he MCD simutation shall be capable of deploying an IR mining field as defined in the VIDS Functional Specification of communicating the presence and characteristics of this into all participants in the exercise.				erform correlation of newty disclosed data with data from evious disclosures.	5	ا ر ا	se knowledge of sensed entities to prioritize threats.
₹ -	vns. The VIDS Step 2 will simul enade Launcher / Rapid Obscur ssile Countermeasure Device	The ROS simulation shall:	Be capable of deploying any of the three types of smoke as defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay until the turret is positioned.	Initiate and mututain for each smoke deployment the boation of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.		The MCD simulation shall be capable of deploying an IR lamming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.	th as sented re an			Perform correlation of newty disclosed data with data from previous disclosures.	ठ	fige of all	Use knowledge of sensed entities to prioritize threats.
₹ -	measure Simulations. The VIDS Step 2 will simuli- it-Salvo Smoke Grenade Launcher / Rapid Obscur (ROS) and the Missile Countermeasure Device	The ROS simulation shall:	Be capable of deploying any of the three types of smoke as defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay until the turret is positioned.	Initiate and mututain for each smoke deployment the location of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.	Initiate an appropriate visual effect for the smoke screen being generated and communicate to all participants in the exercise.	The MCD simulation shall be capeble of deploying an IR jamming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.				Perform correlation of newty disclosed data with data from previous disclosures.	5	ا ر ا	Use knowledge of sensed entities to prioritize threats.
₹	measure Simulations. The VIDS Step 2 will simuli- it-Salvo Smoke Grenade Launcher / Rapid Obscur (ROS) and the Missile Countermeasure Device	The ROS simulation shall:	Be capable of deploying any of the three types of smoke as defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay until the turret is positioned.	Initiate and mututain for each smoke deployment the location of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.	Initiate an appropriate visual effect for the smoke screen being generated and communicate to all participants in the exercise.	The MCD simulation shall be capeble of deploying an IR parming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.				Perform correlation of newty disclosed data with data from previous disclosures.	5	ا ر ا	Use knowledge of sensed entities to prioritize tineals.
₹ -	Countermeasure Simulations. The VIDS Step 2 will simulation the Multi-Salvo Smoke Grenade Launcher / Rapid Obscur System (ROS) and the Missile Countermeasure Device (MCD).		Be capable of deploying any of the three types of smoke a defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay the turret is positioned.	Initiate and matritain for each smoke deployment the local of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.	Initiale an appropriate visual effect for the smoke screen to generated and communicate to all participants in the exer-	The MCD simulation shall be capeble of deploying an IR jamming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.			Monitor all disclosed data from activities as perceived by the sensors and:	Perform correlation of newty disclosed data with data from previous disclosures.	Perform fushin of data from different sensor's disclosures of the same or related ectivities.	Use the correlated and fused data to maintain knowlodge of all sensed entities and known links between weapons and launching platforms.	
	Countermeasure Simulations. The VIDS Step 2 will simulation the Multi-Salvo Smoke Grenade Launcher / Rapid Obscur System (ROS) and the Missile Countermeasure Device (MCD).		Be capable of deploying any of the three types of smoke a defined in the VIDS Functional Specification. When deployment requires turret motion deployment shall delay the turret is positioned.	Initiate and matritain for each smoke deployment the local of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.	Initials an appropriate visual effect for the smoke screen to generated and communicate to all participants in the exertion.	The MCD simulation shall be capable of deploying an IR jamming field as defined in the VIDS Functional Specifical and communicating the presence and characteristics of the field to all participants in the exercise.	Characteristics of the ROS and MCD simulations such as processing and/or deployment times shall be implemented parameters so that they may be easily modified before an exercise.	Countermeasures Management. VIDS Step 2 shall:	Monitor all disclosed data from activities as perceived by the sensors and:	Perform correlation of newty disclosed data with data from previous disclosures.	Perform fushin of data from different sensor's disclosures of the same or related ectivities.	Use the correlated and fused data to maintain knowlodge of all sensed entities and known links between weapons and launching platforms.	
	Countermeasure Simulations. The VIDS Step 2 will simulation the Multi-Salvo Smoke Grenade Launcher / Rapid Obscur System (ROS) and the Missile Countermeasure Device (MCD).		Be capable of deploying any of the three types of smoke a defined in the VIDS Functional Specification. When deployment requires turnet motion deployment shall delay the turnet is positioned.	Initiate and matritain for each smoke deployment the local of the effective volume of the smoke screen created for the effective duration of the smoke screen. Communicate the presence and characteristics of this smoke screen to all participants in the exercise.	Initials an appropriate visual effect for the smoke screen to generated and communicate to all participants in the exertion.	1.1.3.2. The MCD simulation shall be capable of deploying an IR jamming field as defined in the VIDS Functional Specification and communicating the presence and characteristics of this field to all participants in the exercise.	Characteristics of the ROS and MCD simulations such as processing and/or deployment times shall be implemented parameters so that they may be easily modified before an exercise.	Countermeasures Management, VIDS Step 2 shall:	Monitor all disclosed data from activities as perceived by the sensors and:	Perform correlation of newty disclosed data with data from previous disclosures.	Perform fushin of data from different sensor's disclosures of the same or related ectivities.	Use the correlated and fused data to maintain knowlodge of all sensed entities and known finks between weapons and launching platforms.	1.1.4.3. Use knowledge of sensed entities to prioritize tireals.

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	12	hreat and klighting in the	inst selected C and the urret	or if SEMI- d initiate turret fre or CM	les are	mual firing of s main gun.	of manual firing of coverage of	C Mode and		grenados.	s armed.		of manual	IC Mode and	taken.	ination of Functional Iomatic turrel
	12	əd ihreat and packlighting in the	against selected ATIC and the	IC or if SEMI- ssed initiate turret terfire or CM	nades are	manual firing of the main gun.	ity of manual firing , and coverage of	A FIC Mode and		g of grenados.	M is armed.		iily of manual	ATIC Mode and CD # AUTOMATIC	on taken.	armination of DS Functional automatic turret
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	12	to selected threat and splay by backlighting in the	directed against selected -AUTOMATIC and the any needed turret	NUTOMATIC or il SEMI: n is depressed initiate turret ing Counterline or CM	when grenades are	pability of manual fining of of sight of the main gun.	te capability of manual faing a number, and coverage of	r AUTOMATIC Mode and		Atlate firing of grenados.	y when CM is armed.	A available.	de capability of manual n.	r AUTOMATIC Mode and tuse of MCD if AUTOMATIC	I OFF action taken.	upon determination of I in the VIDS Functional seding an automatic turret eployment.
	12	ied to selected threat and a display by backlighting in the	be directed against selected EMI-AUTOMATIC and the tte any needed turnel	# AUTOMATIC or il SEMI- ilich is depressed initiate turret during Counterline or CM	liky when grenades are	capability of manual fining of ne of sight of the main gun.	ovide capability of manual firing type number, and coverage of	C or AUTOMATIC Mode and		d initiate firing of grenedos.	bility when CM is armed.	I IVI available.	ovide capability of manual Alon.	C or AUTOMATIC Mode and late use of MCD # AUTOMATIC	CM OFF action taken.	ted upon determination of ned in the VIDS Functional roceeding an extornatic turret V deployment.
	12	ipplied to selected threat and the display by backlighting in the	uld be directed against selected i SEMI-AUTOMATIC and the nitiate any needed turnst	bd. # AUTOMATIC or if SEMI- switch is depressed initiate turret ing during Counterline or CM	nability when grenades are	ride capability of manusal fining of ut line of sight of the main gun.	s provide capability of manual firing ult) type number, and coverage of	Medical election and and and and and and and allower a		and initiate firing of grenados.	apability when CM is armed.	U S IKM available.	s provide capability of manual) button.	ATIC or AUTOMATIC Mode and initiate use of MCD # AUTOMATIC	en CM OFF action taken.	itiated upon determination of foliated in the VIDS Functional y proceeding an extomatic turrel CM deployment.
	12	se applied to selected threat and on the display by backlighting in the	should be directed against selected or if SEMI-AUTOMATIC and the id initiate any needed turrel	vated. # AUTOMATIC or if SEMI- imb switch is depressed initiate turret anning during Counterline or CM	capability when grenades are ad,	wovide capability of manual fining of about line of sight of the main gun.	ode provide capability of manual firing efault) type number, and coverage of	MANTIC or AUTOMATIC Mode and		ing and initiate firing of grenados.	n capability when CM is armed.	MOD IS INCIDENTE.	ode provide capability of manual (CD biston.	DMATIC or AUTOMATIC Mode and	when CM OFF action taken.	e initiated upon determination of as dofined in the VIDS Functional stely proceeding an extomatic turret s or CM deployment.
	12	aid be applied to selected threat and tion on the display by backlighting in the	ire should be directed against selected IC or if SEMI-AUTOMATIC and the ssed initiate any needed turrel	activated. # AUTOMATIC or if SEMI: thumb switch is depressed initiate turret scanning during Counterline or CM	on capability when grenades are rmed,	de provide capability of manual fining of ad about line of sight of the main gun.	L Mode provide capability of manual firing x default) type number, and coverage of	JIOMATIC or AUTOMATIC Mode and		e firing and initiate firing of grenados.	alion capability when CM is armed.	de mod is live available.	L Mode provide capability of manual ig MCD button.	UTOMATIC or AUTOMATIC Mode and d CM, initiate use of MCD # AUTOMATIC essed.	CD when CM OFF action taken.	Ill be intilated upon determination of is (as defined in the VIDS Functional ediately proceeding an extomatic turret rifle or CM deployment.
	12	hould be applied to selected threat and ndation on the display by backlighting in the	terlire should be directed against selected #ATIC or if SEMI-AUTOMATIC and the pressed initiate any needed turrel	is activated. # AUTOMATIC or if SEMI- the thumb switch is depressed initiate turret and scanning during Counterline or CM	ltation capability when grenades are is armed,	Mode provide capability of manual firing of tered about line of sight of the main gun.	UAL Mode provide capability of manual firing d (or default) type number, and coverage of	-AUTOMATIC or AUTOMATIC Mode and		tiale firing and initiate firing of grenados.	natistion capability when CM is armed.	MOUS INCLUSION AVAILABLE.	UAL Mode provide capability of manual ising MCD button.	H-AUTOMATIC or AUTOMATIC Mode and Indeed CM, initiate use of MCD # AUTOMATIC lenessed.	MCD when CM OFF action taken.	shall be initiated upon determination of reats (as defined in the VIDS Functional mmediately proceeding an extomatic turret strerite or CM deployment.
	12	M should be applied to selected threat and mendation on the display by backlighting in the	ounterlire should be directed against selected OMATIC or if SEMI-AUTOMATIC and the s depressed initiate any needed turnel	can is activated. If AUTOMATIC or if SEMI- and the thumb switch is depressed initiate turret ispend scanning during Counterfire or CM	i initation capability when grenades are 3M is armed.	FF Mode provide capability of manual fining of centered about line of sight of the main gun.	ANI IAL Mode provide capability of manual firing imed (or default) type number, and coverage of	EMI-AUTOMATIC or AUTOMATIC Mode and		i initiale firing and initiate firing of grenados.	20 initiation capability when CM is armed.	Tri mode mod is not available.	ANUAL Mode provide capability of manual D using MCD braton.	EMI-AUTOMATIC or AUTOMATIC Mode and mended CM, initiate use of MCD # AUTOMATIC hidenessed.	te of MCD when CM OFF action taken.	rm shall be initiated upon determination of 1 threats (as defined in the VIDS Functional or immediately proceeding an extomatic turret Counterfire or CM deployment.
	12	I CM should be applied to selected threat and ommendation on the display by backlighting in the eld.	If Counterline should be directed against selected VUTOMATIC or if SEMI-AUTOMATIC and the this depressed initiate any needed turnel	il Scan is activated. Il AUTOMATIC or il SEMI: C and the thumb switch is depressed initiate turret Suspend scanning during Counterfire or CM	IOS initiation capability when grenades are id CM is armed.	s OFF Mode provide capability of manual fining of ies centered about line of sight of the main gun.	n MANI IAL Mode provide capability of manual firing rammed (or default) type number, and coverage of	e SEMI-AUTOMATIC or AUTOMATIC Mode and		and initiate firing and initiate firing of grenados.	MCD initiation capability when CM is armed.	OUT MOUSE MOUST AVAILABLES.	e MANUAL Mode provide capability of manual MCD using MCD button.	e SEMI-AUTOMATIC or AUTOMATIC Mode and ommended CM, initiate use of MCD # AUTOMATIC wilch depressed.	use of MCD when CM OFF action taken.	alarm shall be initiated upon determination of ting threats (as defined in the VIDS Functional in) or immediately proceeding an extomatic turret for Courterfre or CM deployment.
	12	ne if CM should be applied to selected threat and recommendation on the display by backlighting in the Field.	ne if Counterlire should be directed against selected If AUTOMATIC or if SEMI-AUTOMATIC and the witch is depressed initiate any needed turnel	ne if Scan is activated. If AUTOMATIC or if SEMI- ATIC and the thumb switch is depressed initiate turret int. Suspend scanning during Counterfire or CM	a ROS initiation capability when grenades are and CM is armed.	ithe OFF Mode provide capability of manual fining of nades centered about line of sight of the main gun.	I the MANI IAL Mode provide capability of manual firing regrammed (or default) type number, and coverage of s.	In the SEMI-AUTOMATIC or AUTOMATIC Mode and		ant and initiate firing and initiate firing of grenados.	an MCD initiation capability when CM is armed.	THE OTT MOUSE MOUSE IN AVAILABLE	I the MANUAL Mode provide capability of manual of MCD using MCD button.	1 the SEMI-AUTOMATIC or AUTOMATIC Mode and recommended CM, initiate use of MCD # AUTOMATIC n switch depressed.	Inne use of MCD when CM OFF action taken.	ble alarm shall be initiated upon determination of sxisting threats (as defined in the VIDS Functional atton) or immediately proceeding an extomatic turret in for Courterfre or CM deployment.
	12	rmine if CM should be applied to selected threat and are recommendation on the display by backlighting in the late Field.	rmine if Counterlire should be directed against selected it. If AUTOMATIC or if SEMI-AUTOMATIC and the b switch is depressed initiate any needed turnel	rmine if Scan is activated. If AUTOMATIC or if SEMI- OMATIC and the thumb switch is depressed initiate turret iment. Suspend scanning during Counterline or CM iy.	ide a ROS initiation capability when grenades are able and CM is armed.	n in the OFF Mode provide capability of manual fining of grenades centered about line of sight of the main gun.	in the MANUIAL Mode provide capability of manual firing e-programmed (or default) type number, and coverage of ades.	n in the SEMI-AUTOMATIC or AUTOMATIC Mode and	age based upon selected threat type and inventory. I MATIC or if thumb switch depressed initials any nee	ement and initiate firing and initiate firing of grenados.	ide an MCD initiation capability when CM is armed.	III III OCT MOUS MOUS ING AVAILABITE.	n in the MANUAL Mode provide capability of manual tion of MCD using MCD button.	in the SEMI-AUTOMATIC or AUTOMATIC Mode and bis recommended CM, initiate use of MCD if AUTOMATIC makin switch depressed.	ontime use of MCD when CM OFF action taken.	uritible alarm shall be initiated upon determination of the axisting threats (as defined in the VIDS Functional distinction) or immediately proceeding an enfomatic turret ament for Counterfire or CM deployment.
	12	etermine if CM should be applied to selected threat and dicate recommendation on the display by backlighting in the M Data Field.	elermine if Counterlire should be directed against selected reat. If AUTOMATIC or if SEMI-AUTOMATIC and the umb switch is depressed initiate any needed turrel	otermine if Scan is activated. # AUTOMATIC or if SEMI: UFOMATIC and the thumb switch is depressed initiate turret overnent. Suspend scanning during Counterline or CM stivity.	rovide a ROS initiation capability when grenades are relable and CM is armed.	then in the OFF Mode provide capability of manual fining of the grenades centered about line of sight of the main gun.	then in the MANt IAL Mode provide capability of manual firing pre-programmed (or default) type number, and coverage of enades.	then in the SEMI-AUTOMATIC or AUTOMATIC Mode and	age based upon selected threat type and inventory. I MATIC or if thumb switch depressed initials any nee	overnent and initiate firing and initiate firing of grenados.	rovide an MCD initiation capability when CM is armed.	THE IN THE CIT MOUNT IN AVAILABLE.	Then in the MANNOAL Mode provide capability of manual litiation of MCD using MCD button.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and ICD is recommended CM, initiate use of MCD if AUTOMATIC if halm switch depressed.	iscontinue use of MCD when CM OFF action taken.	n auxitible alarm shall be initiated upon determination of entain existing threats (as defined in the VIDS Functional pecification) or immediately proceeding an enfomatic turret overnent for Counterfre or CM deployment.
	12	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in the CM Data Field.	Determine if Counterlire should be directed against selected threat. If AUTOMATIC or if SEMI-AUTOMATIC and the Ihumb switch is depressed initiate any needed turnel	SEMI- ate tur CM	Provide a ROS initiation capability when grenades are available and CM is armed.	When in the OFF Mode provide capability of manual firing of four grenades centered about line of sight of the main gun.	When in the MANUAL Mode provide capability of manual firing of pre-programmed (or default) type number, and coverage of grenades.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and	_ &	movement and initiate firing and initiate firing of grenados.	Provide an MCD initiation capability when CM is armed.	Wisci III III O C F IMOUG IMOU B IMO AVAILADIO.	When in the MANUAL Mode provide capability of manual initiation of MCD using MCD button.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and MCD is recommended CM, initiate use of MCD if AUTOMATIC or if palm switch depressed.	Discontinue use of MCD when CM OFF action taken.	An auritible alarm shall be initiated upon determination of certain existing threats (as defined in the VIDS Functional Specification) or immediately proceeding an automatic turret movement for Courterfre or CM deployment.
	12	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in the CM Data Field.	Determine if Counterlire should be directed against selected threat. If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate any needed turnel	Determine if Scan is activated. # AUTOMATIC or if SEMI- AUTOMATIC and the thumb switch is depressed initiate turret movement. Suspend scanning during Counterline or CM activity.	Provide a ROS initiation capability when grenades are available and CM is armed.	When in the OFF Mode provide capability of manual firing of four grenades centered about line of sight of the main gun.	Whon in the MANU ML Mode provide capability of manual firing of pre-programmed (or default) type number, and coverage of grenades.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and	age based upon selected threat type and inventory. I MATIC or if thumb switch depressed initials any nee	movement and initiate firing and initiate firing of grenados.	Provide an MCD initiation capability when CM is armed.	Witer mind O'T mode mod is not available.	When in the MANUAL Mode provide capability of manual initiation of MCD using MCD button.	When in the SEMI-AUTOMATIC or AUTOMATIC Mode and MCD is recommended CM, initiate use of MCD if AUTOMATIC or if palm switch depressed.	Discontinue use of MCD when CM OFF action taken.	An auritible alarm shall be initiated upon determination of certain existing threats (as defined in the VIDS Functional Specification) or immediately proceeding an automatic turnel movement for Counterfire or CM deployment.
	12	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in the CM Data Field.		Determine if Scan is activated. If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate tur movement. Suspend scanning during Counterlire or CM activity.	Provide a ROS initiation capability when grenades are available and CM is armed.	When in the OFF Mode provide capability of manual firing of four grenades centered about line of sight of the main gun.	Whon in the MANI IAL Mode provide capability of manual firing of pre-programmed (or default) type number, and coverage of grenades.		Coverage based upon selected threat type and inventory. AUTOMATIC or if thumb switch depressed initiate any nee	movement and initiate firing and frittate firing of granados.	Provide an MCD initiation capability when CM is armed.	Wind of I moue mou signification		When in the SEMI-AUTOMATIC or AUTOMATIC Mode and MCD is recommended CM, initiate use of MCD if AUTOMATIC or if palm switch depressed.	Discontinue use of MCD when CM OFF action taken.	An auritible alarm shall be initiated upon determination of certain existing threats (as defined in the VIDS Functional Specification) or immediately proceeding an eutomatic turnel movement for Counterfire or CM deployment.
	Indicate on the Tackcal Display the highest priority or opera selected threat by blinking the associated Jcon.	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in t CM Data Field.	3	Determine if Scan is activated. If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate tur movement. Suspend scanning during Counterlire or CM activity.					Coverage based upon selected threat type and inventory. AUTOMATIC or if thumb switch depressed initiate any nee							
	Indicate on the Tackcal Display the highest priority or opera selected threat by blinking the associated Jcon.	Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in t CM Data Field.	3	Determine if Scan is activated. If AUTOMATIC or if SEMI-AUTOMATIC and the thumb switch is depressed initiate tur movement. Suspend scanning during Counterlire or CM activity.					Coverage based upon selected threat type and inventory. AUTOMATIC or if thumb switch depressed initiate any nee							
	Indicate on the Tackcal Display the highest priority or opera selected threat by blinking the associated Jcon.	1.1.4.5. Determine if CM should be applied to selected threat and indicate recommendation on the display by backlighting in the CM Data Field.	1.1.4.6. Determine if Courterfire should be directed against selected (revised for threat. If AUTOMATIC or if SEMI-AUTOMATIC and the phase 2) thumb switch is depressed initiate any needed turns	1.1.4.7. Determine if Scan is activated. If AUTOMATIC or if SEMI- (revised for AUTOMATIC and the thumb switch is depressed initiate turret phase 2) movement. Suspend scanning during Counterlire or CM activity.		1.1.4.8.1. When in the OFF Mode provide capability of manual firing of four grenades centered about line of sight of the main gun.	1.1.4.9.2. Whon in the MANLIAL Mode provide capability of manual fining of pre-programmed (or default) type number, and coverage of grenades.	1.1.4.8.3. When in the SEMI-AUTOMATIC or AUTOMATIC Mode and freeign of the second state of the second stat	Coverage based upon selected threat type and inventory. AUTOMATIC or if thumb switch depressed initiate any nee		1.1.4.9. Provide an MCD initiation capability when CM is armed.		1.14.9.2. When in the MANUAL Mode provide capability of manual (revised for initiation of MCD using MCD button.		1.1.4.9.4. Discontinue use of MCD when CM OFF action taken.	1.1.4.10. An auritible alarm shall be initiated upon determination of certain existing threats (as dofined in the VIDS Functional Specification) or immediately proceeding an automatic turnel movement for Counterfire or CM deployment.

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	Selective Initialization VIDS Step 2 shall:	Provide a capability to selectively load any combination of the implemented VIDS Sensor and Countermeasures at initialization.	Allow modification of recommended threat to countermens pairing at initialization.	Provide VIDS threat platforms and Weapons Systems. The VIDS Step 2 activities will modify the BDS-D SAFOR so that it can be used to evaluate the effectiveness and sultability of the VIDS survivability suites by providing:	New Simulated Titreat Platforms. VIDS Step 2 shall modify the performance characteristics of existing BDS-D SATOR platforms to simulate the T-90, the MI-24A-HND/F, and the BRDM-2 to meet the specifications of the VIDS Functional Specification.	New Simulated Weapons Systems. VIDS Step 2 shall:	Modify the existing BDS-D HEAT and SABOT lank rounds to meet the specifications of the VIDS Functional Specification.	Modify the existing BOS-D TOW missite to meet the specifications of the VIDS Functional Specification for simulation of the US. Helitire and Soviet AT-2C. AT-4, AT-6, AT-9, and AT-11 ATGMs.	I tave weepons systems using laser designators, laser beam ritting, laser range finders, laser jammers, or other laser uses communicate the presence and characteristics of this activity to all participants in the exercise.	I lave missiles using their boosler/sustainer, large railber gun firings or other systems producing inlense optically sensible liefts communicate the presence and characteristics of this activity to all participants in the exercise.	Have weepons systems using RF uplink, track or search re or other RF uses communicate the presence and characteristics of this activity to all participants in the exerc	
	Selective Initializa	Provide a capabi implemented VID initialization.	Allow modification of new pairing at initialization.	Provide VIDS the The VIDS Step 2 so that it can be suffability of the	New Simulated Title performance plantage to semu BRDM-2 to meet Specification.	New Simulated V	Modify the existing meet the specific.	Modify the existing BDS-E specifications of the VIDS simulation of the US. Helli AT-9, and AT-11 ATGMs.	I lave weapons systems using la riding, laser range finders, laser i communicate the presence and o to all participants in the exercise.	I lave missiles us firings or other sy fields communica activity to all parti	I lave weapons so or other RF uses characteristics of	deleted.
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	Have all weapon systems monitor the exercise to determine the occurrence of any non-tengible field produced by CM or other systems which could have an effect on its operation and use the data to modify their behavior accordingly.	Maintain CM characteristics such as time needed to defeat and probability of effectiveness as parameters so that they may be easily modified before an exercise.	ğ	Provide a capability to selectively load any combination of the imple: "ited VIDS SAFOR simulated threat platforms for an exercise."	Provide a capability to selectively load the VIDS SAFOR simulated threat platforms with the implemented VIDS weapons systems for an exercise.	Provide VIDS Logistice. The VIDS Step2 activities will modify the existing BDS-D logistics to provide:	M1 Simulator Expendables Re-Supply Logistic support shall be provided for the M1 at the Battlemaster position which shall have the capability to re-constitute the M1 in place.		Provide a fully equipped VIDS equipped combat vehi	The updated Tactical Display shall provide the following:	Show any combination of the following available CMs in the CM Select Field: VIS (ROS), IR (ROS), MANW (ROS), MCD CPS, CMINE, ATRJ, TCS, NBCOP, Chall/Flares, LCMD.	ê ê	For VIS, IR, and MMW show number of grenades to be dispensed by a Manual activation in the CM Select Flold	For CPS, show Flekl of Regard (in degrees).	When Chaff/Flares is an available CM, show the current inventory in the CM Stores Field.	Backlight the CM the TRM recomments (or is using) for highest priority threat.
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2.2	When ICS is an available CM, show the current inventory in the CM Stores Fleld.										Ë							
2.3	Provide the following new threat types in the Tureat Position Field: MINE, GUN, HCPTR, TANK, SUPPVEH, NBC CHEM, UPLINK, SEARCH, TRACK																	
2.4	Provide dynamic mapping between available countermeasures and SPARE FFKs. Assume maximum of 6 without FASR, otherwise 5 with FASR.																	
2.5	Provide dynamic mapping between SPARE FFK and FASR when it is an available sensor.								_									
2.6	Add CPS sector setup menu.			E				F	F	E	H	E		E	E			Γ
2.7	Provide menu to enable/disable auto activation of CMs.										L	E		E				
2.8	Change Threat icons to Indicate tank or holicopier.								H		H				E			Г
2.9	Allow muzzle flash as modifier.								片		H							
2.10.																	F	
2.11	Indicate the positions of recently fired smoke grenaries in the Threat toon Flekt.																	
2.11.1	Delete the fired grenade kon after n seconds, where n is a parameter.																	
2.12	Use SoundBlaster for all warning tones and voice signals.	E		E				E	F		F	E	E	E			F	
2.13	Provkte the following CPS CM functions:		\vdash					E	H				F					
2.13.1	When CPS is available, the TRM needs to decide if the CPS is to be used to counter a threat.																	
2.13.2	When property coofinated with the TC, the M1 VIOS needs to issue the jamming field with a sector size as set by the TC																	
	(from 5 to 120 degrees).		\exists															
2.14	Provide the following TRWR sensor functions:										_				_		F	
2.14.1	When TRWR is available, sense the oresence of RADAR energy.												E					
2.14.2	Supply RADAR threat reports to the TRM.	E			L		F	F	H	E	F	E	F			F	+	Γ
2.15	Provide the following MINE sensor functions:	E			E	E		E			F	E	E			F	-	L
2.15.1	When MINE is available, sense the presence of real and take mines.																	
2.15.2	Supply real and false mine threat reports to the TRM.																	
2.15.3	Apply the vehicle brakes when a mine is detected.																	
2.16	Provide the following VEMASID CM functions.		H								+	Ė	F	Ė			+	T
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	When VEMASID is available, the TRM needs to decide if VEMASID is to be used to counter a mine threat.	When properly coodinated with the TC, the M1 VIDIS will be able to initiate a VEMASID CM action and broadcast the presence of the VEMASID field.	Provide the following ATRJ CM functions:	When ATRJ is available, the TRM needs to decide if the A is to be used to counter a threat.	When preparty executionted with the TC, the M1 VIDS near issue the farming flekt.	Provide the following FASR sensor functions:	When FASR is available, sense the radar search returns.	When proyectly exactionated with the IC, the M I VIDS shall able to broadcast the presence of the TADAR search field.	When ATRJ energy is present, all new and updated FASR threat reports shall be discarded.	Provide the following TCS CM functions:	When TCS is available, determine if a missile or projectile impact has been intercepted/defeated by TCS.	Resupply the TCS inventory through Battlemaster or keybo command.	Provide the following NIS sensor functions:	When NIS is available, sense the presence of helicopters.	Support the detection and identification of helicopiers by ty and supply reports to the TRM.	Make detection and id	Provide the following MFD functions:	When MFD is available, sense the presence of main gun muzzle flashes.	Supply muzzle flash threat reports to the TRM.	Provide the following NBC sensor functions:	When NBC is available, sense the presence of chemical, nuclear or blokonical poisonous cases.	Kill the tank if poison exists even if NBC is not available.	Uso a maximum exposure time to determine when to kill the lank.	Provide the following NRCOP CM functions:
	When VEMASID is available, the VEMASID is to be used to count	When properly coodinated with able to initiate a VEMASID CM presence of the VEMASID field	Provide the following ATRJ (When ATRJ is available, the is to be used to counter a th	When preparty coordinated issue the jamming flekt.	Provide the following FAS	When FASR is available,	When proporty candingle able to broadcast the pre-	When ATRJ energy is pr threat reports shall be di	Provide the following TC	When TCS is available impact has been interc	Resupply the TCS invector	Provide the following I	When NIS is available	Support the detection and supply reports to	Make detection and id	Provide the following	When MFD is availab muzzle flashes.	Supply muzzle flash II	Provide the following	When NBC is availab	Kill the tank if poison	Uso a maximum ex lank.	Provide the following
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	When NBCOP is available, the TRM needs to decide if the NBCOP is to be used to counter a poison threat. When property coolinated with the TC, the M1 VIDS will be helected poison. Activation of NBCOP shall extend the exposure time to a helected poison. Activation of NBCOP shall extend the exposure time to a helected poison. Activation of NBCOP shall extend the exposure time to a helected poison. When property coordinated with the TG, the M1 VIDS will be the to tentiate a Chalifferes CM action and brondcast their wasance. When property coordinated with the TC, the M1 VIDS will be the to following Chalifferes inventory through Battlemaster or teryboard command. Provide the following LCMD CM functions: When CLMD is available, the TIM needs to decide if the CMD is to be used to counter a threat. When CLMD is to be used to counter a threat. When CLMD is available, the TIM needs to decide if the CMD is to be used to counter a threat. When CLMD is available, the TIM needs to decide if the CMD is to be used to counter a threat. When CLMD is to be used to counter a threat. When CLMD is to be used to counter a threat reports from any ombination of new sensors. In TIM shall the late of the correlated information to make leadshow as at byte, priority and recommended CM to be used leadshow as at byte, priority and recommended CM to be used leadshow as at byte. TOUS shall be used to communicate the presence of electropicales the threat. What shall the activated in paraflel against multiple threats. What shall be used to communicate the presence of electropical reports. Was shall be used to communicate the presence of electropical and threat series of the existing TC paths switch. Was shall be used to communicate the completion of an used of the existing TC paths switch. Was shall be indicated and threat series of the control shall be indicated and threat and threat series.	4 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2											

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* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	e CM to the detected threat azimuth blitzed unit the CM is deachvated.	i the CM to be coincident with the conally stabilized until the CM is is automatically activated.
* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	o the CM to the detected threat azimuth stabilized unii the CM is deachrated.	ate the CM to be coincident with the stitionally stabilized until the CM is 3M is automatically activated.
* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	tale the CM to the detected threat azimuth By stabilized unii the CM is deachvated.	rotate the CM to be coincident with the positionally stabilized until the CM is e. CM is automatically activated.
* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	I rotate the CM to the detected threat azimuth mally stabilized until the CM is deachvated.	half rotate the CM to be coincident with the left positionally stabilized until the CM is if the CM is automatically activated.
* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	half rotate the CM to the detected threat azimuth sitionally stabilized until the CM is deachvated.	g shelf rotate the CM to be coincident with the remain positionally stabilized until the CM is until the CM is automatically activated.
* - 6 6 * - 6 6 - 6 6 6 6 6 6 6 6 6	g shalf rotate the CM to the detected threat azimuth positionally stabilized until the CM is deactivated.	ving shelf rotate the CM to be coincident with the nd remain positionally stabilized until the CM is or until the CM is automatically activated.
* - 6 6 * - 6 6 6 6 6 6 6 6 6 6 6 6	wing shall rotate the CM to the detected threat azimuth	Newing shall rotate the CM to be coincident with the name positionally stabilized until the CM is ed or until the CM is automatically activated.
* - 6 6 * - 6 6 6 6 6 6 6 6 6 6 6 6	slewing shall rotate the CM to the detected threat azimuth main positionally stabilized unit the CM is deactivated.	al stewing shall rotate the CM to be coincident with the gun and remain positionally stabilized unit the CM is valed or unit the CM is automatically activated.
* - 6 6 * - 6 6 6 6 6 6 6 6 6 6 6 6	to slewing shall rotate the CM to the detected threat azimuth d remain positionally stabilized unit the CM is deactivated.	unuel stewing shalf notate the CM to be coincident with the the gun and remain positionally stabilized until the CM is activated or until the CM is automatically activated.
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -	Auto slewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deactivated.	章 医
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 - 6 T - 7	Auto slewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deactivated.	Manual stewing shall notate the CM to be coincident with the main gun and remain positionally stabilized until the CM is descrivated or until the CM is automatically activated.
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 T -	Auto slewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deachvated.	Manuel stewing shalf rotate the CM to be coincident with the main gun and remain positionally stabilized until the CM is deachivated or until the CM is automatically activated.
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 - 7 T - 7	Auto slewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deachvated.	Manual stewing shalf rotate the CM to be coincident with the main gun and remain positionally stabilized until the CM is deachivated or until the CM is automatically activated.
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 - 7 T - 7	Auto stewing shall rotate the CM to the detected threat and remain positionally stabilized until the CM is deach	
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 T -	Auto stewing shall rotate the CM to the detected threat and remain positionally stabilized until the CM is deach	
T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 6 6 T - 7 T -	2.33.1 Auto stewing shall rotate the CM to the detected threat azimuth and remain positionally stabilized until the CM is deachvated.	2.33.2 Manuel stewing shalf rotate the CM to be coincident with the main gun and remain positionally stabilized until the CM is deactivated or until the CM is automatically activated.

8. Notes. **Definitions Acronyms** Advanced Threat Radar Jammer **ATRI AVSE** Armored Vehicle Survivability Equipment Commander's Controls Display Panel CCDP Counterfire CFIRE CM Countermeasure **CPS** Combat Protection System CSC Computer Software Component **CSCI** Computer Software Configuration Item CSU Computer Software Unit FASR Future Armored System Radar Forward Looking Infrared FLIR Graphics Technologies GT IDD Interface Description Document Laser Countermeasure Device LCMD LWR Laser Warning Receiver Management Command and Control MCC Missile Countermeasure Device MCD Muzzle Flash Detector **MFD** Missile Warning System **MWS** Nuclear Biological Chemical Overpressure **NBCOP** Nuclear Chemical Sensor **NCS** NIS Non-Imaging Sensor Personal Computer PC Rapid Obscuration System ROS SAF Semi-Automated Forces SCC Simulation Control Console Simulation Network **SIMNET** Soldier Machine Interface SMI

SIMNET
Simulation Control Console
SIMNET
Simulation Network
SMI
Soldier Machine Interface
TCS
Threat Countermeasure System
TRWR
Tank Radar Warning Receiver

VehicleID An integer triplet consisting of site, host and

vehicle numbers. Used to uniquely identify

an entity within a battle exercise.

VEMASID Vehicle Magnetic Signature Duplication

VIDS Vehicle Integrated Defense System

Appendix A. Sensor/Countermeasure Configuration File Content

```
# This is the VIDS data file. It is read at startup.
# All data elements are preceded by a label. After the label
# there will be one or more data values which will be delimited
# by tabs. Any characters inserted between tabs will be
# considered to be a data value (even a blank space).
# All time, angular measurements, probabilities and distances
# are defined as floating point values.
VIDS_Console_Site
VIDS_Console_Host
VIDS_Console_Vehicle
                                                            10
                                                           1
Available_Sensors
Available_CMs
                                                            LWR
                                                                       MWS
                                                                                                                       NIS
                                                                                                                                   TRWR
                                                                                                                                               MINE
                                                                       RO5
                                                                                   CMINE
                                                                                                           NBCOP
                                                            MCD
Auto_Activated_CMs
                                                                        ROS
                                                                                   CMINE
                                                                                                           NBCOP
                                                           10
Max_Threats
VIDS_Processing_Delay
                                                           0.2
# Sensor Parameters
                                                           1.2
MWS.Response_Time_in_sec
MWS.Alarm_Duration_in_sec
MWS.Max_Detection_Distance_in_meter
                                                           3.0
                                                           6000.0
MWS.Max_Approach_Angle_in_Deg
MWS.Azimuth_Coverage_Central_Angle_in_Deg
MWS.Azimuth_Coverage_Delta_in_Deg
                                                           22.5
                                                           0.0
                                                           180.0
MWS.Elevation_Coverage_Central_Angle_in_Deg
MWS.Elevation_Coverage_Delta_in_Deg
MWS.Detection_Probability
                                                           15.0
                                                           25.0
                                                           0.98
MWS.Detection_Accuracy_in_Deg
                                                           2.0
                                                           30.0
MWS.Life_Countdown_in_sec
LWR.Response_Time_in_sec
                                                           3.0
LWR_Alarm_Duration_in_sec
LWR.Azimuth_Coverage_Central_Angle_in_Deg
LWR.Azimuth_Coverage_Delta_in_Deg
LWR.Elevation_Coverage_Central_Angle_in_Deg
LWR.Elevation_Coverage_Delta_in_Deg
                                                           0.0
                                                           180.0
                                                           15.0
                                                           25.0
                                                           0.92
LWR Detection_Probability_LRF
LWR Detection_Probability_LBR
                                                           0.97
                                                           0.97
LWR Detection_Probability_LDES
LWR Detection Accuracy_in_Deg
                                                           3.0
                                                           30.0
LWR_Life_Countdown_in_sec
                                                           0.5
FASR.Response_Time_in_sec
FASR Alarm Duration in sec
                                                           3.0
                                                           5000.0
FASR.Max_Detection_Distance_in_meter
                                                           0.0
FASR_Azimuth_Coverage_Central_Angle_in_Deg
                                                           10 0
FASR Azimuth_Coverage_Delta_in_Deg
FASR Elevation_Coverage_Central_Angle_in_Deg
                                                           0.0
FASR Elevation_Coverage_Delta_in_Deg
                                                           5.0
                                                           0.95
FASR.Detection_Probability
FASR.Identification_Probability
                                                           0.90
FASR Detection_Accuracy_in_Deg
                                                           1.0
FASR.Update_Frequency_in_sec
                                                           5.0
FASR Life_Countdown_in_sec
                                                           60.0
MINE.Response_Time_in_sec
                                                           0.2
MINE.Alarm_Duration_in_sec
                                                           2.0
MINE Max_Detection_Distance_in_meter
                                                           36.5
MINE.Azimuth_Coverage_Central_Angle_in_Deg
                                                           0.0
MINE.Azimuth_Coverage_Delta_in_Deg
                                                           11.8
MINE.Elevation_Coverage_Central_Angle_in_Deg
                                                           -43.51
MINE Elevation_Coverage_Delta_in_Deg
                                                           1.49
MINE.Detection_Probability_Real
                                                           0.90
MINE Detection_Probability_False
                                                           0.10
MINE Detection_Accuracy_in_Deg
                                                           0.0
MINE Life Countdown in sec
                                                           30.0
                                                           4.0
NIS.Response_Time_in_sec
NIS.Alarm_Duration_in_sec
                                                           3.0
```

```
NIS.Azimuth_Coverage_Central_Angle_in_Deg
NIS.Azimuth_Coverage_Delta_in_Deg
NIS.Elevation_Coverage_Central_Angle_in_Deg
                                                                   180.0
                                                                   0.0
 NIS.Elevation_Coverage_Delta_in_Deg
NIS.Detection_Distances_Engine_Off
NIS.Detection_Probabilities_Engine_Off
                                                                   60.0
                                                                                             10000.0
                                                                   5000.0
                                                                                7000.0
                                                                                                          12000.0
                                                                                                                       15000.0
                                                                                                                                     18000 0
                                                                   1.0
                                                                                0.93
                                                                                             0.90
                                                                                                          0.85
                                                                                                                       0.73
                                                                                                                                     0.50
 NIS.Identification_Distances_Engine_Off
                                                                   5000.0
                                                                                7000.0
                                                                                             10000.0
 NIS.Identification_Probabilities_Engine_Off
                                                                                88.0
                                                                                             0.66
 NIS.Detection_Distances_Engine_On
                                                                   2000.0
                                                                                4000.0
                                                                                             7000.0
                                                                                                          10000.0
                                                                                                                      12000.0
                                                                                                                                    15000.0
 NIS. Detection_Probabilities_Engine_On
                                                                   1.0
                                                                                0.90
                                                                                             0.79
                                                                                                          0.71
                                                                                                                       0.64
                                                                                                                                    0.57
 NIS.Identification_Distances_Engine_On NIS.Identification_Probabilities_Engine_On
                                                                   2000.0
                                                                                4000.0
                                                                                             7000.0
                                                                   1.0
                                                                                0.84
 NIS.Detection_Accuracy_in_Deg
                                                                   6.0
 NIS.Update_Frequency_in_sec
NIS.Life_Countdown_in_sec
                                                                   5.0
                                                                   60.0
 TRWR.Response_Time_in_sec
                                                                   1.0
 TRWR.Alarm_Duration_in_sec
                                                                   3.0
 TRWR.Azimuth_Coverage_Central_Angle_in_Deg
TRWR.Azimuth_Coverage_Delta_in_Deg
                                                                   0.0
                                                                   120.0
 TRWR Elevation_Coverage_Central_Angle_in_Deg TRWR Elevation_Coverage_Delta_in_Deg
                                                                   37.5
                                                                   42.5
 TRWR.Detection_Probability
                                                                   0.99
 TRWR.Detection_Accuracy_in_Deg
                                                                   10.0
 TRWR.Life_Countdown_in_sec
                                                                   30.0
 MFD.Response_Time_in_sec
                                                                   0.5
 MFD.Alarm_Duration_in_sec
MFD.Azimuth_Coverage_Central_Angle_in_Deg
                                                                   0.5
                                                                   0.0
 MFD.Azimuth_Coverage_Delta_in_Deg
MFD.Elevation_Coverage_Central_Angle_in_Deg
                                                                   180.0
                                                                   15.0
 MFD.Elevation_Coverage_Delta_in_Deg
                                                                   25.0
 MFD.Detection_Probability
                                                                   0.95
 MFD.Detection_Accuracy_in_Deg
                                                                  2.0
 MFD.Life_Countdown_in_sec
                                                                   30.0
NCS.Response_Time_in_sec
NCS.Alarm_Duration_in_sec
                                                                  0.5
                                                                  3.0
NCS.Azimuth_Coverage_Central_Angle_in_Deg
NCS.Azimuth_Coverage_Delta_in_Deg
NCS.Elevation_Coverage_Central_Angle_in_Deg
                                                                  0.0
                                                                  180.0
                                                                  0.0
 NCS.Elevation_Coverage_Delta_in_Deg
                                                                  90.0
 NCS.Detection_Probability
                                                                  0.95
 NCS.Detection_Accuracy_in_Deg
                                                                  0.0
 NCS.Life_Countdown_in_hour
                                                                  8.0
 # Countermeasures
ROS.Coverage_Angle_in_Deg
ROS.Max_Turret_Rotation_Rate
                                                                  15.0
                                                                  45.0
 ROS.Launch_Distance_in_meter
                                                                  30.0
 ROS.Response_Time_in_sec
                                                                  0.0
MCD.Response_Time_in_sec
                                                                  0.2
MCD.Jam.Time_in_sec
MCD.Azimuth_Coverage_Central_Angle_in_Deg
MCD.Azimuth_Coverage_Delta_in_Deg
                                                                  3.0
                                                                  0.0
                                                                  11.0
MCD.Elevation_Coverage_Central_Angle_in_Deg
                                                                  0.0
MCD.Elevation_Coverage_Delta_in_Deg
                                                                  5.0
MCD.Max_Turret_Rate
                                                                  128.57
CPS.Response_Time_in_sec ,
                                                                  0.5
CPS.Jam_Time_in_sec
                                                                  3.0
CPS.Azimuth_Coverage_Central_Angle_in_Deg
                                                                  0.0
CPS.Azimuth_Coverage_Delta_in_Deg
CPS.Elevation_Coverage_Central_Angle_in_Deg
                                                                  60.0
                                                                  15.0
CPS.Elevation_Coverage_Delta_in_Deg
                                                                  15.0
CPS.Max_Turret_Rate
                                                                  128.57
LCMD.Response_Time_in_sec
                                                                 0.5
LCMD.Jam_Time_in_sec
                                                                 3.0
LCMD.Decoy_Distance_in_meter
                                                                  20.0
LCMD.Max_Turret_Rate
                                                                  360.0
CMINE.Response_Time_in_sec
CMINE.Jam_Time_in_sec
                                                                 0.5
                                                                 3.0
NBCOP.Response_Time_in_sec
                                                                 30.0
NBCOP.Crew_Life_Countdown_in_sec NBCOP.Activation_Time_in_hour
                                                                 60.0
                                                                 8.0
NBCOP.Decontamination_Probability
                                                                 0.95
```

```
ATRI.Response_Time_in_sec
ATRI.Jam_Time_in_sec
                                                                  0.5
3.0
 ATRIAzimuth_Coverage_Central_Angle_in_Deg
ATRI.Azimuth_Coverage_Delts_in_Deg
ATRI.Elevation_Coverage_Central_Angle_in_Deg
ATRI.Elevation_Coverage_Delta_in_Deg
                                                                  0.0
                                                                  180.0
                                                                  40.0
                                                                  50.0
  ATRIMAX_Turret_Rate
                                                                  128.57
 TCS.Coverage_Angle_in_Deg
                                                                  90.0
  TCS.Inventory
                                                                  2
                                                                              2
                                                                                           2
                                                                                                        2
                                                                  0.5
30
 Chaff.Response_Time_in_sec
 Chaff.Inventory
                                                                  8.0
 Chaff.Duration_in_sec
 Chaff, Launch_Distance_in_meter
                                                                  75.0
 Chaff.Launch_Angle_in_Deg
                                                                  45.0
 Chaff.Radius_in_meter
                                                                  21.0
 Chaff_Max_Turret_Rate
                                                                  128.37
 Flares.Response_Time_in_sec
Flares.Inventory
                                                                 0.5
                                                                 30
 Flares. Duration in sec
                                                                  4.0
 Flares Launch_Distance_in_meter
                                                                  150.0
 Flares.Launch_Angle_in_Deg
Flares.Radius_in_meter
                                                                 45.0
                                                                  22.0
 Flares.Max_Turret_Rate
                                                                  128.57
 CFIRE.Max_Turret_Rate
                                                                 45.0
 TSCAN.Max_Turret_Rate
                                                                 3.0
 Data_Collection_PDU_Period_in_sec
The following defines the grenade load for the turret sectors
starting from the gun (top) and going clockwise in 15 degree increments.
Label_tab_L8A1 tab_M76 tab_XM81, top and clockwise
 Sector_0
 Sector_15
                                                    0
 Sector_30
 Sector_45
 Sector_60
                                                    0
 Sector_75
 Sector_90
 Sector_105
                                                    0
 Sector_120
 Sector_135
                                                    0
 Sector_150
 Sector_165
                                                    0
Sector_180
Sector_195
                                                    0
Sector_210
Sector_225
                                                    0
Sector_240
Sector_255
                                                    0
Sector_270
Sector_285
                                                    0
Sector_300
Sector_315
                                                    0
Sector_330
Sector_345
                                       2
# The following is the CM Threat Mapping to be used by VIDS.
# Valid Order values: 0 - 8. The 0 order is the first CM to be used.
#threat class
                                       priority
                                                   list of CMs in priority selection order
                                                                CPS
CPS
CPS
Class_1
                                                                             MCD
                                                                                                                   IR
                                                                                                                                             Flares
Class_2
                                       13
                                                                             MCD
                                                                                          VIS
                                                                                                                   IR
                                                                                                                                              Flares
Class_3
                                       10
                                                                             MCD
                                                                                          VIS
                                                                                                                   IR
                                                                CPS
CPS
CPS
Class_4
                                                                             LCMD
                                                                                         IR
                                                                                                                   VIS
Class_5
                                       8
                                                                                                       VIS
Class_6
                                                                             MCD
                                                                                          vis
                                                                                                                   IR
                                                                CPS
CPS
CPS
Class_7
                                                                             IR
                                                                                                      VIS
Class_8
                                                                             MCD
                                                                                          VIS
                                                                                                                   İR
Class_9
                                                                                         IR
                                                                                                                   VIS
Class_10
                                                                                                      IR
Class_Mine
                                                                 CMINE
                                                                NBCOP
Class_Chemical
                                                                CPS
CPS
Class_Muzzie
                                                                             VIS
                                                                                                      IR
Class_Muzzle_w_LRF
                                                                             VIS
                                                                                                      IR
Class_Muzzle_w_TCS
                                                                             VIS
```

Class_Helicopter	15
Class_Tank	16
Class_Infantry_Support	17